TECHNICAL MEMORANDUM

Date: May 26, 2009

Project No.: 073-80026

To: Kathy Economy

Company: Abandoned Mine Lands Program, Mining and Minerals Division, New Mexico EMNRD

From: Fiona Jordan

CC: Robert Newcomer

Email: fjordan@golder.com; bnewcomer@golder.com

RE: Findings of Barbara J Sites, Abandoned Uranium Mine Lands Pilot Study Conducted March-May, 2009

1.0 INTRODUCTION AND PILOT STUDY OBJECTIVES

This memo describes the results of the Pilot Study performed by Golder Associates Inc. (Golder) at the above-referenced abandoned uranium mine sites during March-April, 2009. Golder, is under contract to the Abandoned Mine Land (AML) Program of the Mining and Minerals Division (MMD), to provide services relating to the closure of mine openings and reclamation of abandoned uranium mine lands (AUMLs) in the Poison Canyon area of the Grants Uranium District. As part of this contract, a work plan for the assessment of various sites was submitted by Golder in February 2009. The approach to completing the work plan was tailored to a narrower scoped pilot study in early April. The following outlines the objectives of the pilot study work plan at the Barbara J abandoned mine sites:

- Conduct radiological gamma ray surveys of the Barbara J mine sites and surrounding area;
- Map and describe individual mine features in these areas; and
- Collect representative soil samples from the area to assist the AML program in assessing the potential environmental hazards associated with radioactive materials at these sites.

The results of the pilot study are being presented and evaluated relative to the development of subsequent scope and direction of the project.

2.0 SCOPE OF WORK OF THE PILOT STUDY

The Barbara J area includes several unguarded mine/drill-hole openings as well as elevated levels of ionizing gamma radiation (ranging from 15 to greater than 2000 microR/hr). The radiation is primarily associated with uranium (U) and its daughter decay products (e.g. radium-226, thorium-230 and radon). These conditions represent an apparent hazard to human health and the environment. The more elevated radiation levels are typically associated with piles of mineralized waste rock, drill cuttings, miscellaneous debris, and apparent load-out areas. Some of these materials have been redistributed by erosion and previous earthwork at the sites.

Golder Associates Inc.
5200 Pasadena NE, Suite C
Albuquerque, New Mexico 87113
Tel: (505) 821-3043 Fax: (505) 821-5273 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

3.0 PURPOSE OF PILOT STUDY

The principal purpose of the pilot study was to investigate and acquire appropriate and defensible data to aid in delineating the impacted areas so that engineering designs could be prepared to effectively address the effects of ionizing radiation associated with the wastes and other materials at the mine sites.

Other purposes included:

- Assessment of the cost effectiveness of survey methods/techniques in evaluating these types of sites and to meet project objectives;
- Assessment of the technical aspects/sensitivities of the methods used and their effectiveness in meeting objectives;
- Provide information to allow decision making regarding subsequent site assessments and project scope decisions by the MMD.

4.0 BACKGROUND INFORMATION

The radiological surveys associated with this pilot study were conducted at four of the more accessible sites in the Poison Canyon area (the Barbara J No. 1, No. 2, No. 3 and No. 3a mine sites), which are located just north of Haystack Road about 2 miles west from New Mexico State Highway 605.

A goal of the study was to collect sufficient radiological data to determine if a defensible relationship between gamma ray emissions and soil radionuclide concentrations could be developed, particularly at the lower soil concentrations that still pose a human health risk (an action level). If this relationship was present and a lower gamma ray activity could be defined, it would be used to delineate areas/soils requiring reclamation/mitigation.

5.0 GAMMA SURVEY RESULTS

The surveys consisted of obtaining gamma radiation measurements with a microR meter and a NaI detector/rate meter along pre-designated points along surveyed transects. Soil samples were collected from selected sites and were analyzed for total uranium, total thorium, Ra-226 and gross alpha/beta specific activity. The survey results were correlated to related gamma ray activity measurements obtained in the field or in Golder's warehouse laboratory at their office in Albuquerque, New Mexico.

Gamma surveys of the Barbara J mine sites were conducted between March 16th and 19th, on April 2nd, and again on April 15th, 2009. Survey points were spaced either 50 or 100 feet apart along the pre-designated transects at each mine site area (Figure 1). The transects spanned areas that had previously been identified by the AML program as surface disturbances associated with the various mine areas (Figure 1). Additional transects were surveyed at the request of the AML project manager to further evaluate gamma ray activity in previously uncharacterized areas adjacent to the mine sites (Figure 2). Gamma ray activity were measured using either a Ludlum Model 2350 or 2221 rate meter equipped with

Ludlum 44-10 shielded 2" X 2" NaI detectors and two Ludlum Model 19 microR meters. The following set of measurements was acquired for each survey point:

- A State Plane (UTM Zone 13) coordinate using a GPS (Global Positioning System) unit;
- A shielded, six-second gamma ray count taken at contact with the ground surface, and;
- An exposure rate measurement (with the microR meter) taken one meter above the ground.

Additionally, all gamma ray activity measuring instruments were calibrated at the Department of Energy's (DOE) calibration pad facility on Highway 605. Gamma ray activity measurements were obtained either by placing the NaI detector in the center of the concrete calibration pad or holding the microR meter one meter above the center of the pad. Gamma ray activity measurements (Figure 3) obtained for the calibration pads were plotted against known values of radioactivity contained within the pads (Leino, et al., 1994; George, et al., 1985). Regression analysis demonstrated a high correlation between radioactivity measurements and meter responses ($R^2 > 0.8$), regardless of meter type. Current calibration certificates for the meters and detectors, results from daily function checks including acceptable count ranges (ACR), and calibration pad data for the microR meters are presented in Attachment A to this letter.

6.0 SOIL SAMPLING AND ANALYSIS RESULTS

Upon review of the gamma ray activity measurements, twenty-five (25) soil sampling locations were identified with the following characteristics:

- Areas 10 feet in diameter with uniform (or near uniform) gamma ray activity measurements; and
- Areas representing gamma ray activity values spanning the range of measurements observed at the four sites.

Soil samples were collected from the center of the identified sampling area to a depth of 15 cm unless refusal was encountered at a shallower depth. Refusal at a shallower depth was only noted for one sample location (Table 1, Barbara J3-3). Within each individual sampling area, a single exposure rate and three, six-second gamma ray activity measurements were made prior to sampling, using a microR meter and a shielded probe, respectively. A single (post-sampling) gamma ray activity measurement was made for the subgrade material. Each sample (approximately 1 kg of material) was collected and stored in reinforced Ziploc© plastic bags.

In Golder's warehouse laboratory, three (3) additional shielded surface-contact gamma ray activity measurements and a single, exposure-rate measurement were made and recorded for each sample. Laboratory gamma ray activity measurements were made by placing the NaI probe directly on top of the bagged sample and placing the sample on a "background" concrete platform (Table 1, "background").

The initial sampling event resulted in the collection of twenty (20) samples representing low-end

measurements. Five (5) additional samples were later collected to capture the high-end range in field measurements (400 to > 2000 microR/h). Due to Department of Transportation (DOT) constraints, only samples with readings less than 250 microR/h were submitted to the ACZ Laboratory (Steamboat Springs, Colorado) for radionuclide analyses. Sixteen (16) soil samples (12 from the initial sampling event and 4 from the latter), that spanned the range in gamma ray activity measurements made in the field and in the Golder laboratory, were submitted for radionuclide analyses. The remaining samples were archived.

As part of the sample preparation at the ACZ Laboratory, the entire sample volume was crushed, pulverized and homogenized prior to sample analysis to prevent bias resulting from any coarse fragments.

The pulverized samples were analyzed for concentrations of the following:

- Radium-226 (Ra-226),
- Total thorium,
- Total uranium, and
- Gross alpha and beta activity

The analytical results are presented in Table 1 and a copy of the ACZ Laboratory analytical reports are included in Attachment B along with the Chain of Custody documentation (COCs). Total uranium and thorium soil concentrations (mg/Kg) were converted to uranium-238 (U-238) and thorium-232 (Th-232) specific activity (*A*, in pCi/g) by combining the following basic radiation principles and the assumption that U-238 and Th-232 are the most abundant isotopes of uranium and thorium in the samples:

$$A = \left(\frac{0.693}{T_{1/2}}\right) N \qquad (1)$$

$$m = \left(\frac{N}{A_o}\right) G_a \qquad (2),$$

Where $T_{1/2}$ is the half-life in minutes of the radionuclide being considered (e.g. U-283 = 2.4 X 10^{15} and Th-232 = 7.4 X 10^{15}), *m* is the mass or concentration (mg/Kg) of the radionuclide, *N* is the number of disintegrating atoms, A_o is Avogadro's constant (6.022 x 10^{23} atoms per g atomic weight) and G_a equals the atomic weight of the radionuclide (U-238 = 238 g/mol and Th-232 = 232 g/mol). One Picocurie (pCi) is equal to 2.2 disintegrating atoms per minute.

7.0 CORRELATION BY REGRESSION ANALYSES

Regression analyses were performed to evaluate whether there was a correlation between measured soil radionuclide (Ra-226 and U-238) concentrations and gamma ray activity counts. Linear relationships, corresponding correlation coefficients, and ninety-five percent (95%) confidence intervals were developed relating the average shielded gamma ray activity counts (measured for samples at the time of sampling in

the field or upon returning to the laboratory) to the actual soil radionuclide concentrations determined by the analytical lab. The equations were corrected for ambient cosmic or natural terrestrial gamma radiation by setting the x- and y-intercepts equal to zero.

Correlation coefficients determined for Ra-226, U-238 and field gamma count relationships were high and significant ($r^2 > 0.7$, $P < 0.05$), suggesting that gamma ray activity measurements made either in the field or in the laboratory could be used to reasonably predict Ra-226 (Figure 4) or U-238 soil concentrations (Figure 5). Gamma ray activity measurements made in the laboratory (red circles, Figures 4 and 5) were significantly lower than those measured in the field. This is believed to reflect the influence of "shine," which is the radial contribution of radiation entering the NaI detector window from sources other than that contained within the sample volume. The "shine" effect was significant despite shielding the probes with lead sleeves.

Additional regression analyses were performed on the relationship between the lower Ra-226 and U-238 concentrations and corresponding gamma ray activity measurements to verify the predictive capacity of the correlation equations in a range more likely to be set as action levels or clean-up goals for the site (i.e., less than 40 pCi/g). The predictive capacity of the correlation between low-end field measurements and soil radionuclide concentrations decreased (i.e., Figure 6, $r^2 = 0.58$ compared to Figure 4, $r^2 = 0.97$), and demonstrated considerable variance as shown by the large 95% confidence interval (blue dashed lines). The X-coefficient also decreased from 0.015 to 0.004. The relationship between U-238 concentrations and low-end field gamma ray activity measurements changed significantly from that derived for the entire dataset (compare blue lines in Figure 5 and 7). The correlation between laboratory gamma ray activity measurements and Ra-226 concentrations (red line) was better (r^2 increased from 0.82 for the entire dataset to 0.86 for the low-end values), but the X-coefficient decreased by a factor of 3. Regression Analysis Summaries are presented in Attachment C. Similar correlations were developed for the microR meter and are presented in Attachment D.

A comparison between the predictive capacity of the correlation developed for the entire Ra-226 field dataset and the correlation developed for the low-end values are shown in Table 2. These results infer that the low-end correlation, despite its lower correlation coefficient, is more accurate at predicting soil radionuclide concentrations from low-end gamma ray activity measurements obtained in the field (< 4000 count/0.1 min) than the correlation developed for the entire dataset. Furthermore, the upper 95% prediction interval for the low-end field measurement correlation estimates a value of 715 counts/0.1 min corresponding to an action level of 5 pCi/g soil Ra-226. In contrast, the upper 95% prediction interval for the entire dataset estimates a value of 312 counts/0.1 min to give an error rate of less than 2.5% that soil concentrations exceed the action level. The latter value sets an unrealistic clean-up goal as it is less than any recorded measurement in the field or "background" condition measured at the Golder laboratory.

Gamma survey results (Fig. 9) and four sets of calculated Ra-226 soil concentrations along with corresponding x, y coordinates were imported into ArcGIS 9.3. As described above, the datasets were populated by converting gamma survey results obtained in the field to Ra-226 concentrations using four different correlation equations:

- The linear relationship between soil Ra-226 levels and corresponding gamma measurements obtained in the field (Fig. 10).
- The linear relationship between soil Ra-226 levels and corresponding gamma measurements obtained in the field, accounting for low-end measurements (Fig. 11).
- The linear relationship between Ra-226 concentrations and gamma measurements developed at the DOE calibration facility (Fig 12).
- A contour map of Barbara J No. 2 using the upper 95% prediction correlation between soil Ra-226 levels and corresponding rate meter responses measured in the field accounting for low-end measurements (Fig. 13).

The values in each of these three datasets (Figure 10, 12-13) were classified into 15 groups along Jenks' natural breaks, which is the default classification method of ArcGIS. This classification scheme finds clusters of data and places class breaks between the clusters, by comparing the sum of squared differences of observed values to the means of their classes. In Figures 9 through 12, the cooler colors (blue) correspond to lower radiation counts/specific activity and the warmer colors (red) correspond to higher counts/activity. The classification scheme for Figure 11 was set the same as Figure 10 for comparison. The contours were drawn in by hand (Figure 13).

8.0 RESULTS SUMMARY

Soil Ra-226 concentrations ranged from 1.2 to 980 pCi/g and total uranium concentrations ranged from 1.3 to 3,000 mg/Kg (0.55-1,008 pCi/g). Total thorium concentrations were significantly lower, ranging from 1.2 to 3.5 mg/Kg, regardless of sample uranium or radium concentrations. Gross alpha and beta concentrations ranged from 7.3 to 1900 and 6.5 to 2,300 pCi/g, respectively.

A total of 1300 gamma ray activity survey points were made over an area spanning approximately 100 acres. Contact, shielded gamma ray activity measurements ranged from 335 to 55,000 counts/0.1 min with Ludlum model 44-10 NaI probes and Ludlum model 2350 or model 2221 rate meters. Exposure rates obtained with Ludlum model 19 microR meters ranged from 12 to over 2,000 uR/h. The "hot" spots (locations exceeding more than 10 times the lowest value reported in the field) generally fell within the surface boundaries and at features previously identified by the AML program with a few exceptions: Golder identified a "hot" spot just south of the Barbara J No. 2 mine along Haystack Rd, two "hot" spots to the north and south of Barbara J No. 3 and possibly another along the section of alluvium draining the Poison Canyon mine area to the north of Barbara J No. 3a. Highly elevated (> 50 times) levels of gamma radiation were typically associated with the presence of thin layers of gravelly limestone in small piles that were less than 4 feet across and about 2 feet high or in what appeared to be load-out areas.

9.0 PILOT STUDY CONCLUSIONS AND RECOMMENDATIONS

Correlation coefficients determined for the best fit lines relating soil Ra-226 and U-238 concentrations to corresponding field gamma ray counts were high and significant ($r^2 > 0.7$, $P < 0.05$) inferring that gamma measurements taken in the field may be used to reasonably predict Ra-226 or U-238 concentrations without the need for more extensive sampling/analyses.

In order to achieve reasonable predictions of soil radionuclide concentrations from the gamma ray activity measurements (laboratory or field), the y- and x-intercepts were set through the origin (0,0) for all correlation equations.

The linear equation relating the lower field gamma ray activity measurements to soil Ra-226 concentrations was used for field gamma ray activity measurements at values less than 4,000 count/0.1 min. This line, despite its lower correlation coefficient, has better predictive capacity to estimate soil Ra-226 concentrations when compared to results derived for the best fit line of the entire dataset. For field gamma ray activity measurements greater than 4,000 count/0.1 min, the equation developed for the entire field dataset was used.

Gamma ray activity measurements made in the laboratory were significantly lower than those measured in the field, reflecting the influence of “shine” encountered in the field. For reclamation/mitigation purposes, it is recommended that random soil samples be validated against the laboratory relationship developed in this investigation.

Attachments or Enclosures:

Table 1	Soil Radiochemistry Results with Corresponding Field and Laboratory Gamma Measurements
Table 2	Predicted Ra-226 Concentrations from Field Gamma Data
Figure 1	Barbara J Gamma Survey Grids
Figure 2	Barbara J Gamma Survey Additional Transect Areas
Figure 3	DOE Calibration Pad Facility Correlations for NaI detectors
Figure 4	Linear Relationships between Gamma Measurements & Soil Ra-226 Concentrations
Figure 5	Linear Relationships between Soil U-238 Concentrations & Gamma Measurements
Figure 6	Linear Relationships between Gamma Measurements & Low-end Soil Ra-226 Concentrations
Figure 7	Linear Relationships between Gamma Measurements & Low-end Soil U-238 Concentrations
Figure 8	Gamma Survey
Figure 9	Ra-226 Concentrations – Field Correlation
Figure 10	Ra-226 Concentrations – Field Correlation (Low-End Measurements)
Figure 11	Ra-226 Concentrations – Calibration Pad Correlation
Figure 12	Ra-226 Concentration Contours
Attachment A	Calibration Pad Certificates and Calibration Pad Data
Attachment B	ACZ Laboratory Analytical Reports
Attachment C	Gamma Ray Activity Measurements Regression Analysis Summaries
Attachment D	MicroR Meter Regression Analysis Summaries

TABLES

TABLE 1
SOIL RADIOCHEMISTRY RESULTS WITH CORRESTPONDING FIELD AND LABORATORY GAMMA MEASUREMENTS

RADIONUCLIDE CHEMICAL ANALYSIS -ACZ								convert from total Uranium	convert from total Thorium	total radionuclides (Ra, U, Th)	Ra-226/U	Th/U	Field Collection Counts				GAI Laboratory Counts		
													Nal Detector (44-10)/Rate Meter			Model 19	Nal Detector (44-10)/Rate Meter		Model 19
Sample Name	Collection Date	Gross Alpha	Gross Beta	Radium 226 (3050)	Solids, Percent	Thorium, total (3050)	Uranium, total (3050)	Uranium 238	Thorium 232				Count/0.1 min			microR/h	Counts/0.1min		microR/hr
		pCi/g	pCi/g	pCi/g	%	mg/Kg	mg/Kg	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	Average	Std Dev	subgrade	contact	Average 2350-4410	Std Dev	contact
BARBARA J#2-4	3/18/09	7.3	6.5	1.2	93.6	2.2	1.63	0.55	0.24	1.99	2.19	0.44	597	57.2	666	19	477	14.2	12
BARBARA J#1-2	3/18/09	13	11	1.9	93.1	2.1	1.43	0.48	0.23	2.61	3.95	0.48	564	62.6	673	19	526	31.5	11
BARBARA J#3-5	3/18/09	13	7.9	1.9	93	3.4	3.5	1.18	0.37	3.45	1.62	0.32	954	24.6	1003	29	555	32.6	15
BARBARA J#3A-2	3/19/09	30	18	5.1	91.8	3.5	3.17	1.07	0.39	6.55	4.79	0.36	1101	139.1	1210	29	522	22.3	12
BARBARA J#3A-5	3/19/09	39	22	7.5	89.8	3.4	5.61	1.88	0.37	9.76	3.98	0.20	890	25.5	916	25	541	42.4	13
BARBARA J#1-1	3/18/09	30	54	8.1	89.1	2.7	12.5	4.20	0.30	12.60	1.93	0.07	2253	696.4	1718	65	620	19.9	15
BARBARA J#1-4	3/18/09	41	27	11	87.3	4.3	7.23	2.43	0.47	13.90	4.53	0.19	1257	110.6	1189	38	564	26.3	13
BARBARA J#3A-4	3/19/09	60	31	11	92.4	2.5	22.2	7.46	0.28	18.73	1.47	0.04	6383	241.8	13931	160	727	15.5	18.5
BARBARA J#2-1	3/18/09	85	39	19	92.9	1.9	9.05	3.04	0.21	22.25	6.25	0.07	4393	822.2	2827	120	1001	76.7	9
BARBARA J#3-2	3/18/09	790	590	39	91.6	4.2	17.3	5.81	0.46	45.27	6.71	0.08	3167	456.0	ND	90	1598	25.2	24
BARBARA J#3-3	3/18/09	180	110	77	93.9	2.4	146	49.06	0.26	126.32	1.57	0.01	7211	799.5	8050	140	2542	285.2	36
BARBARA J#3-4	3/18/09	220	130	86	92.8	2.6	60.9	20.46	0.29	106.75	4.20	0.01	5628	75.6	3462	60	1239	25.5	24
BARBARA J2-1A	4/2/09	470	610	220	95.6	1.4	775	260.40	0.15	480.55	0.84	6.E-04	15797	30.9	15537	ND	4917	30.3	ND
BARBARA J3-3A	4/2/09	470	640	230	94.4	1.6	880	295.67	0.18	525.85	0.78	6.E-04	20491	157.9	23651	400	4472	68.4	nd
BARBARA J3-1A	4/2/09	1400	1700	580	92.1	2.4	2150	722.39	0.26	1302.65	0.80	4.E-04	27895	157.1	21261	800	13241	146.4	nd
BARBARA J3-2AS	4/2/09	1900	2300	980	95.1	1.4	3000	1007.98	0.15	1988.14	0.97	2.E-04	68359	22377	37066	1200	9086	74.3	nd
BACKGROUND	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	525	32	13

TABLE 2
PREDICTED Ra-226 CONCENTRATIONS FROM FIELD GAMMA DATA USING CORRELATION EQUATIONS DEVELOPED FOR THE LOW-END VALUES AND THE ENTIRE DATASET

Sample ID	Field gamma ray activity	Actual Ra-226	Predicted Ra-226	
			(low-end)	(all data)
	counts/0.1 min	pCi/g	pCi/g	pCi/g
BARBARA J#2-4	**597**	**1.2**	2.4	8.8
BARBARA J#1-2	**564**	**1.9**	2.3	8.3
BARBARA J#3-5	**954**	**1.9**	3.8	14.1
BARBARA J#3A-2	**1101**	**5.1**	4.4	16.3
BARBARA J#3A-5	**890**	**7.5**	3.6	13.2
BARBARA J#1-1	**2253**	**8.1**	9.0	33.3
BARBARA J#1-4	**1257**	**11**	5.0	18.6
BARBARA J#3A-4	**6383**	**11**	25.5	94.5
BARBARA J#2-1	**4393**	**19**	17.6	65.0
BARBARA J#3-2	**3167**	**39**	12.7	46.9
BARBARA J#3-3	**7211**	**77**	28.8	106.7
BARBARA J#3-4	**5628**	**86**	22.5	83.3
BARBARA J2-1A	**15797**	**220**	63.2	233.8
BARBARA J3-3A	**20491**	**230**	82.0	303.3
BARBARA J3-1A	**27895**	**580**	111.6	412.8
BARBARA J3-2AS	**68359**	**980**	273.4	1011.7

FIGURES

LEGEND

- Gamma Survey Estimated Area
- AUM Surface Disturbance
- Gamma Sampling Points
- Soil Sampling Locations

REFERENCE

1) Projection: Transverse Mercator Datum, NAD 83 Coordinate System.

110 0 110 Meters

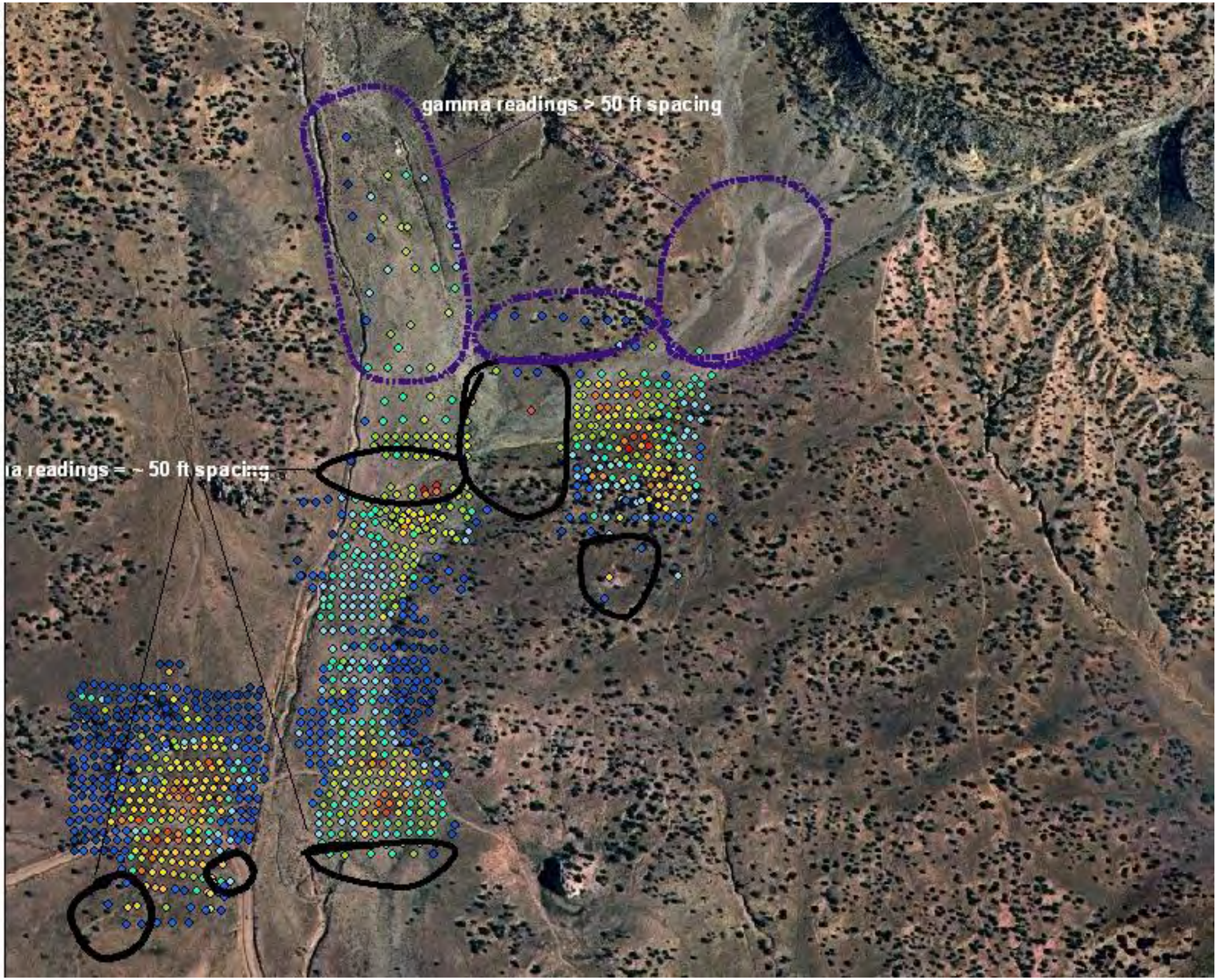
SCALE 1:3,100

PROJECT	EMNRD AML URANIUM MINES McKINLEY COUNTY, NEW MEXICO
TITLE	BARBARA J GAMMA SURVEY GRIDS

Golder Associates
Albuquerque, New Mexico

PROJECT No. 073-80026			SCALE AS SHOWN	REV. 3
DESIGN	---	---	FIGURE 1	
GIS	JR	5/19/2009		
CHECK	FJ	5/19/2009		
REVIEW	BN	5/19/2009		

Project: P:\ABQProjects\2008 Projects\073800026 MMD - Uranium\GIS\ExportFigures\20090519Figure 1.mxd Plot: P:\ABQProjects\2008 Projects\073-80026 MMD - Uranium\GIS\MXDs\UraniumMineFeatures.mxd



LEGEND

AUM BJ rad survey

pCi_g

- 2.9 - 5.0
- 5.0 - 6.4
- 6.4 - 8.1
- 8.1 - 9.8
- 9.8 - 11.9
- 11.9 - 14.6
- 14.6 - 18.13
- 18.1 - 25.0
- 25.0 - 51.4
- 51.4 - 69.7
- 69.7 - 83.7
- 83.7 - 108.1
- 108.1 - 134.6
- 134.6 - 164.7
- 164.7 - 215.6
- 215.6 - 345.1
- 345.1 - 521.0
- 521.0 - 777.6

REFERENCE

1) Projection: Transverse Mercator Datum, NAD 83 Coordinate System.

PROJECT

EMNRD
AML URANIUM MINES
McKINLEY COUNTY, NEW MEXICO

TITLE

BARBARA J GAMMA SURVEY
ADDITIONAL TRANSECT AREAS

Golder Associates
Albuquerque, New Mexico

PROJECT No. 073-80026		
DESIGN	---	---
GIS	JR	5/19/2009
CHECK	FJ	5/19/2009
REVIEW	BN	5/19/2009

FIGURE 2

Project: P:\ABQProjects\2008 Projects\07380026 MMD - Uranium\GIS\Export\Figures\20090519\Figure 2

FIGURE 3
DOE CALIBRATION PAD FACILITY CORRELATIONS FOR THE NAI DETECTORS USED IN THE FIELD

DOE CALIBRATION PADS					
PAD Label	**GE4**	**GE2**	**GPL**	**GPH**	**GPT**
Ra-226 (pCi/g)	83	88	376	67	397
Model 2350-4410	5931	6687	26199	4308	28341
	6032	6631	25878	4236	28356
	6055	6542	26132	4355	28605
		6553		4381	
Average	**6006**	**6620**	**26070**	**4300**	**28434**

PAD Label	**GE4**	**GE2**	**GPL**	**GPH**	**GPT**
Ra-226 (pCi/g)	83	88	376	67	397
Model 2221-4410	5357	5767	22091	3779	24433
meter # 108859	5389	5886	22193	3732	24825
det # PR 114540	5321	5624	22060	3649	24570
Average	**5356**	**5759**	**22115**	**3720**	**24609**

PAD Label	**GE4**	**GPT**	**GE2**	**GPL**	**GPH**
Ra-226 (pCi/g)	83	397	88	376	67
Model 2221-4410a	5309	24971	5652	22384	3650
meter # 115157	5266	25019	5586	22169	3695
det # PR 114540	5359	24874	5689	22050	3702
		25115			
Average	**5311**	**24995**	**5642**	**22201**	**3682**

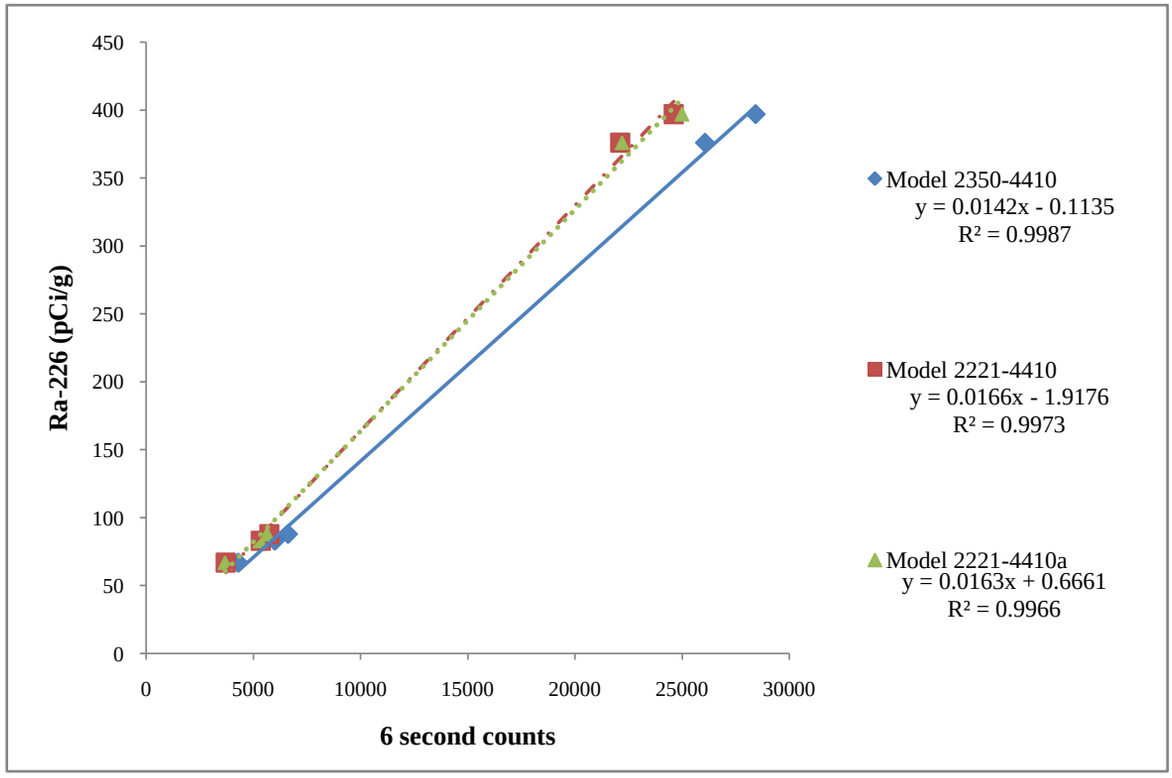
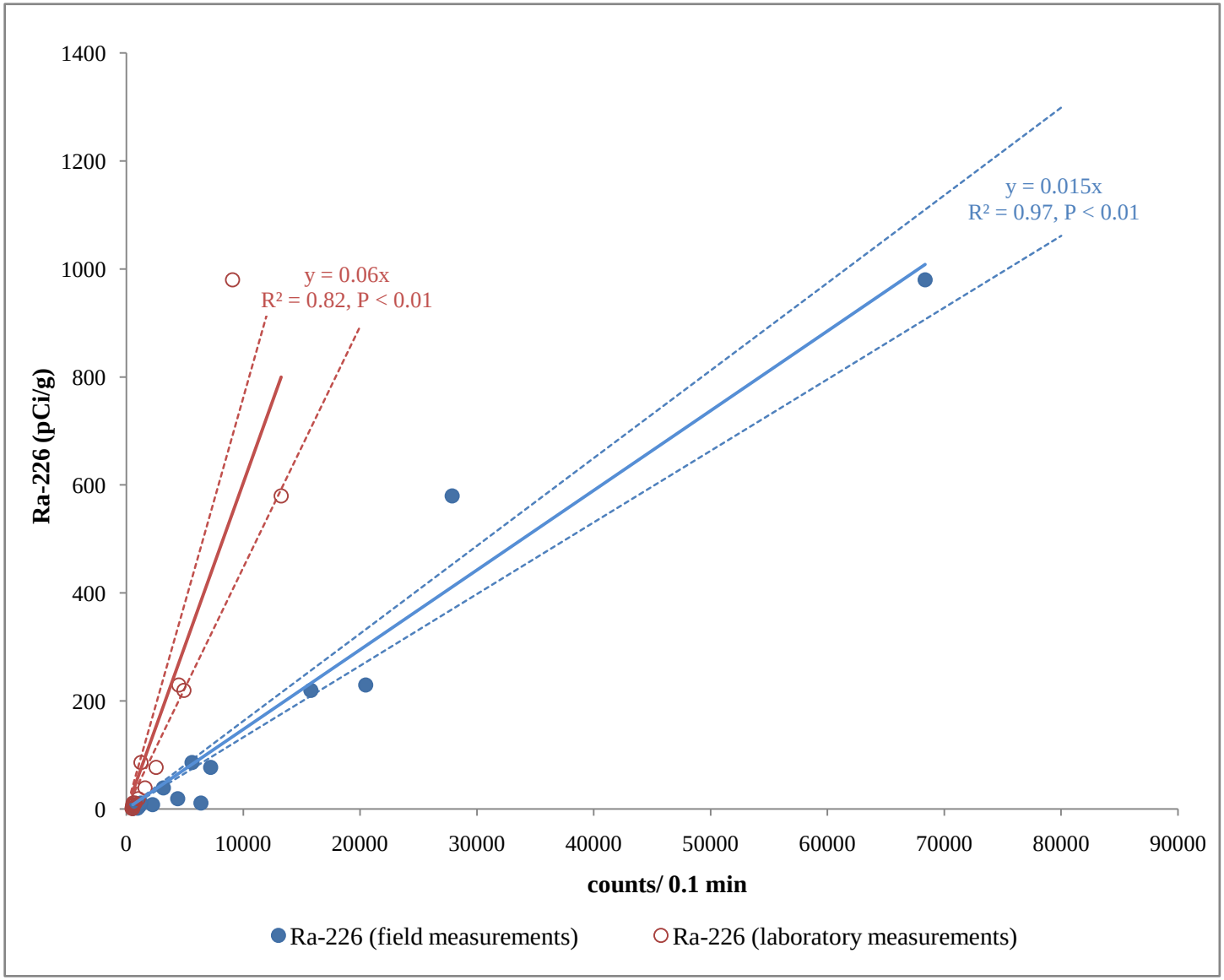


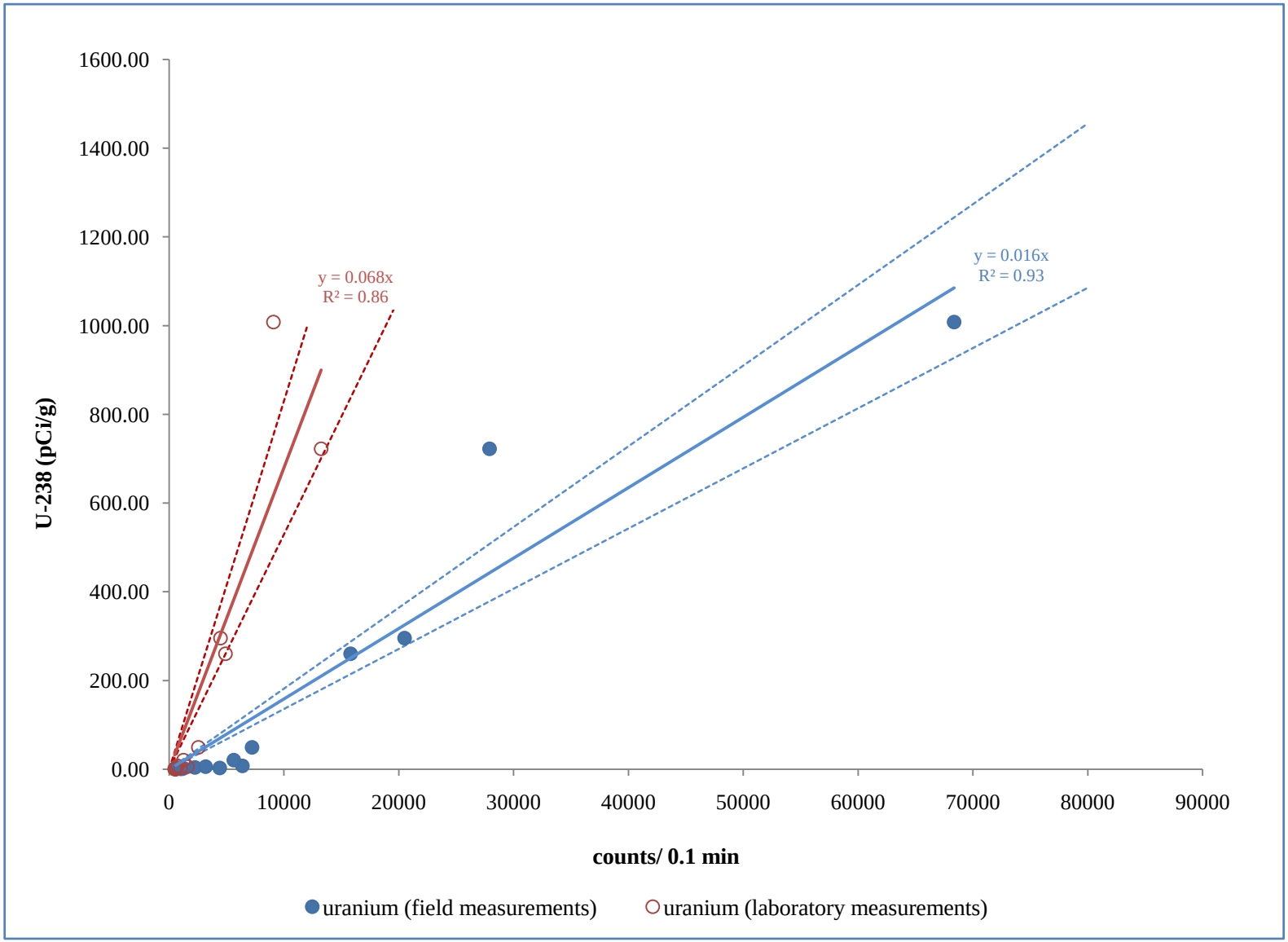
FIGURE 4
LINEAR RELATIONSHIPS BETWEEN GAMMA MEASUREMENTS AND SOIL Ra-226 CONCENTRATIONS



Notes:

Dashed lines represent 95% C.I.

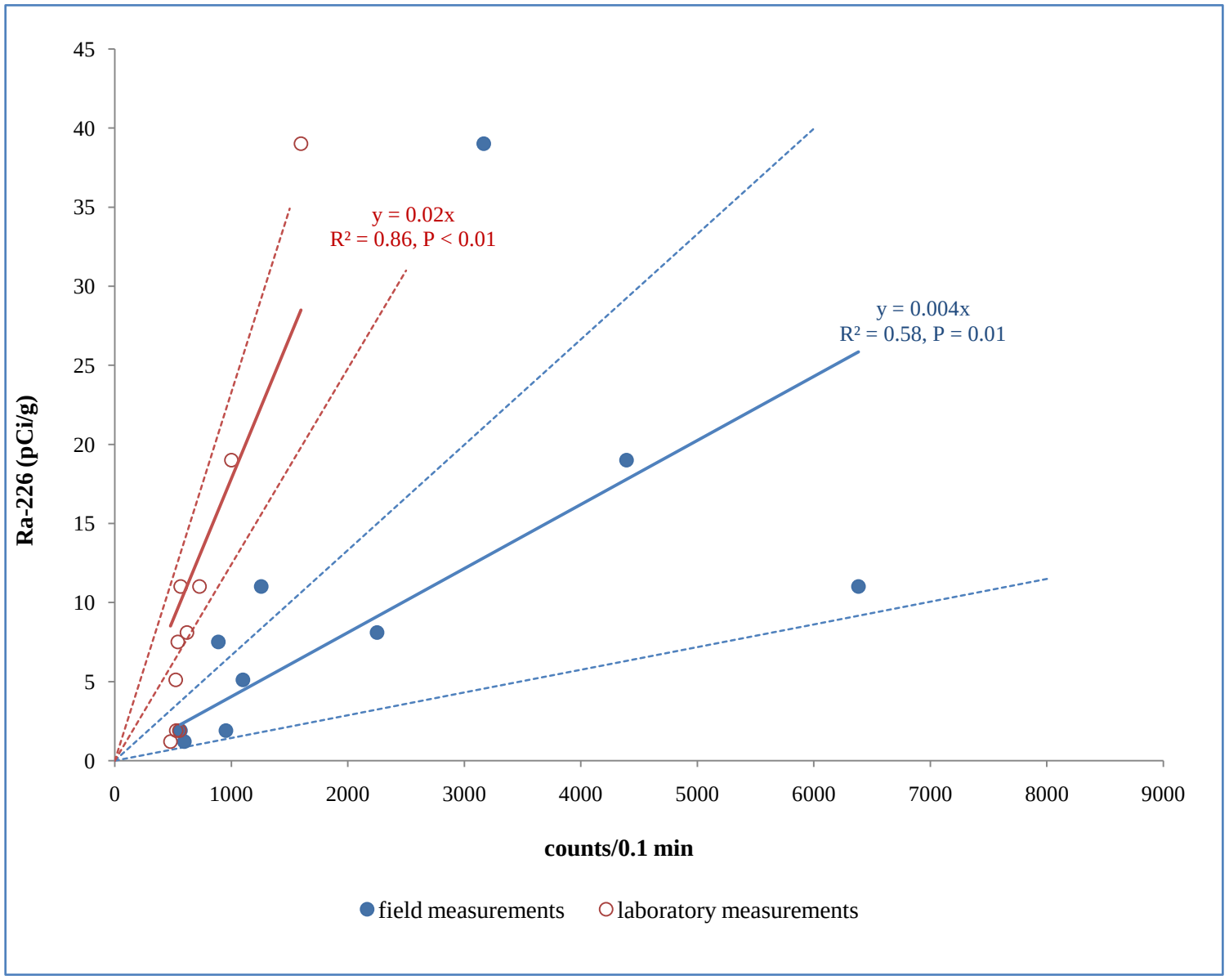
FIGURE 5
LINEAR RELATIONSHIPS BETWEEN SOIL U-238 CONCENTRATIONS AND GAMMA MEASUREMENTS



Notes:

Dashed lines represent 95% C.I.

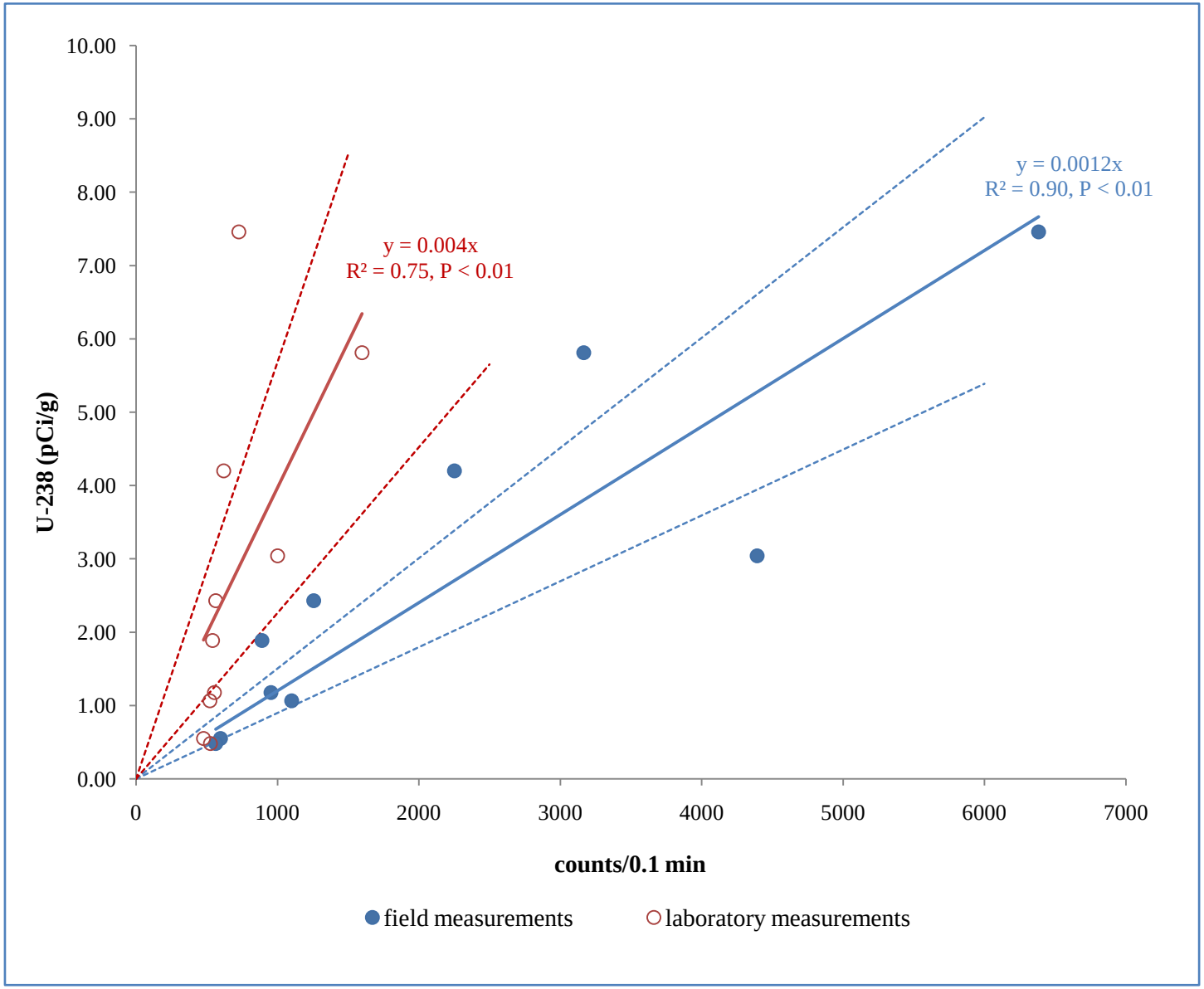
FIGURE 6
LINEAR RELATIONSHIPS BETWEEN GAMMA MEASUREMENTS AND LOW-END SOIL Ra-226 CONCENTRATIONS



Notes:

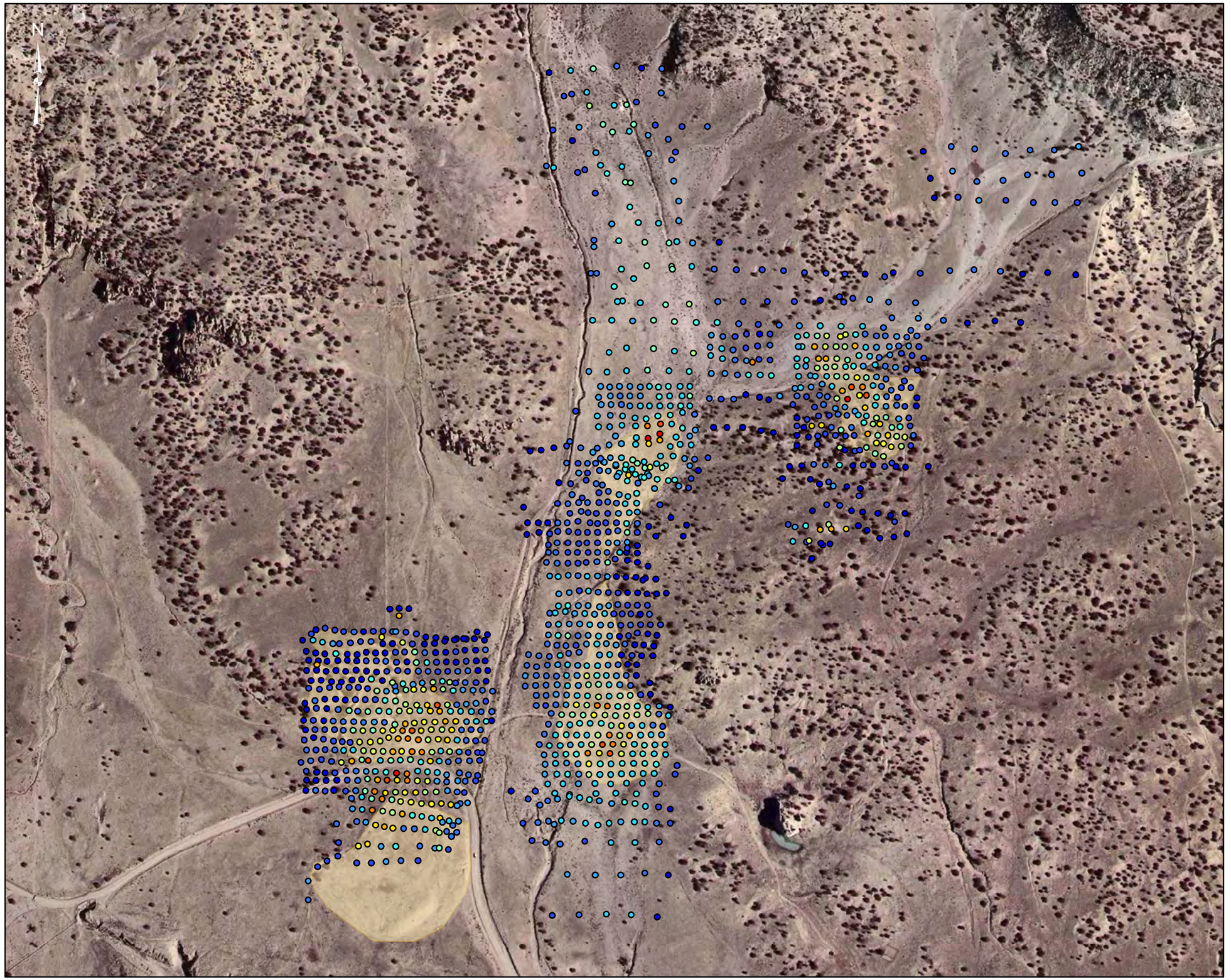
Dashed lines represent 95% C.I.

FIGURE 7
LINEAR RELATIONSHIPS BETWEEN GAMMA MEASUREMENTS AND LOW-END SOIL U-238 CONCENTRATIONS



Notes:

Dashed lines represent 95% C.I.



LEGEND

FieldData_AllGammaSurvey

secondcountscontact_2350

- 335.0 - 566.0
- 566.1 - 700.0
- 700.1 - 852.1
- 852.2 - 1049.0
- 1049.1 - 1323.1
- 1323.2 - 1774.0
- 1774.1 - 2641.2
- 2641.3 - 3777.0
- 3777.1 - 5265.0
- 5265.1 - 6944.9
- 6945.0 - 9099.0
- 9099.1 - 12151.5
- 12151.6 - 17482.7
- 17482.8 - 26549.8
- 26549.9 - 54771.0

REFERENCE

1) Projection: Transverse Mercator Datum, NAD 83 Coordinate System.

200 0 200 Meters

SCALE 1:6,000

PROJECT

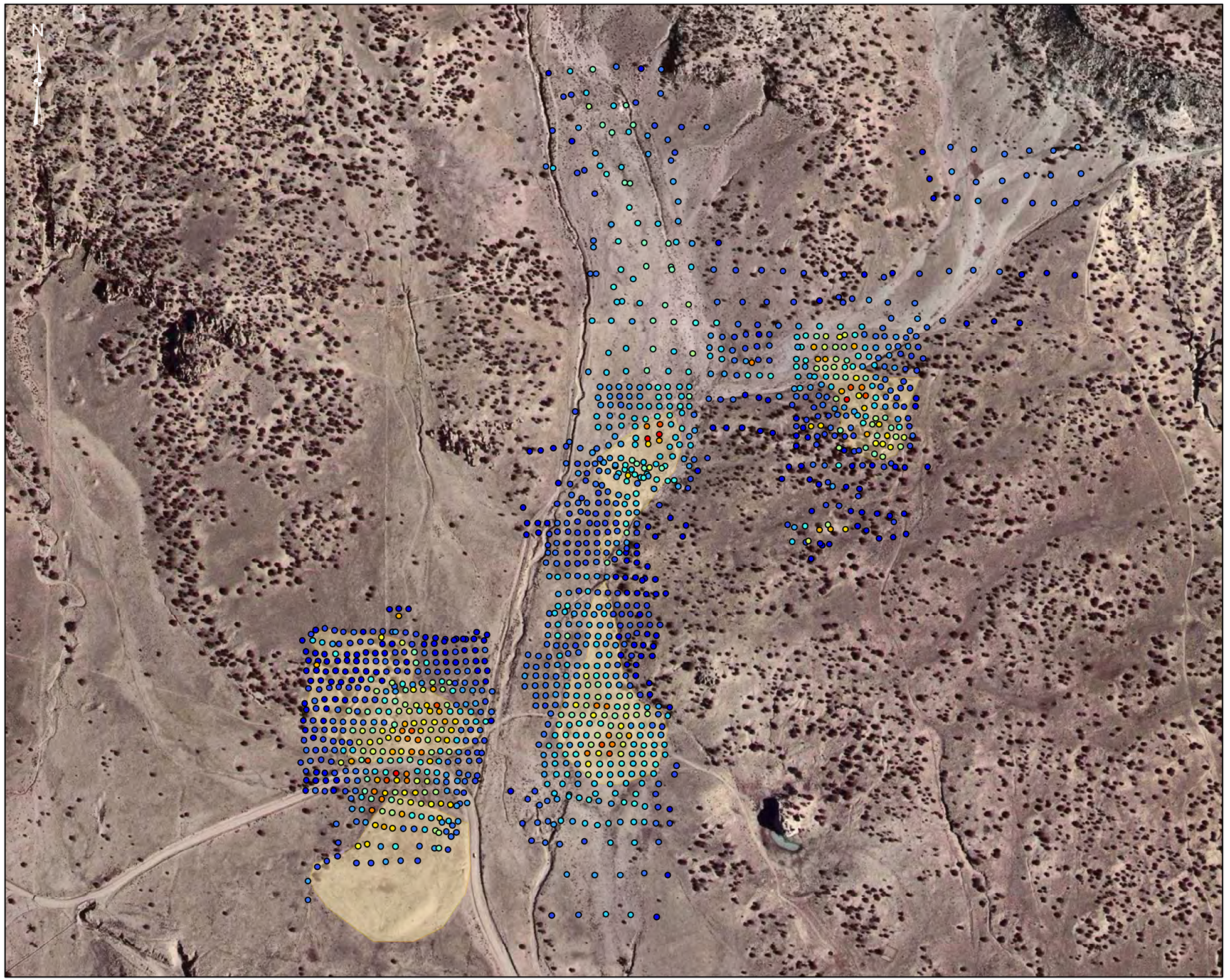
EMNRD
AML URANIUM MINES
McKINLEY COUNTY, NEW MEXICO

TITLE

Gamma Survey

Golder Associates
Albuquerque, New Mexico

PROJECT No. 073-80026			SCALE AS SHOWN	REV. 2
DESIGN	---	---	FIGURE 8	
GIS	JR	5/20/2009		
CHECK	FJ	5/20/2009		
REVIEW	BN	5/20/2009		



LEGEND

FieldData_AllFieldData

SOILDATA__pCi_g_

- 5.0 - 8.4
- 8.5 - 10.4
- 10.5 - 12.6
- 12.7 - 15.5
- 15.6 - 19.6
- 19.7 - 26.3
- 26.4 - 39.1
- 39.2 - 55.9
- 56.0 - 77.9
- 78.0 - 102.8
- 102.9 - 134.7
- 134.8 - 179.8
- 179.9 - 258.7
- 258.8 - 392.9
- 393.0 - 810.6

REFERENCE

1) Projection: Transverse Mercator Datum, NAD 83 Coordinate System.

200 0 200 Meters

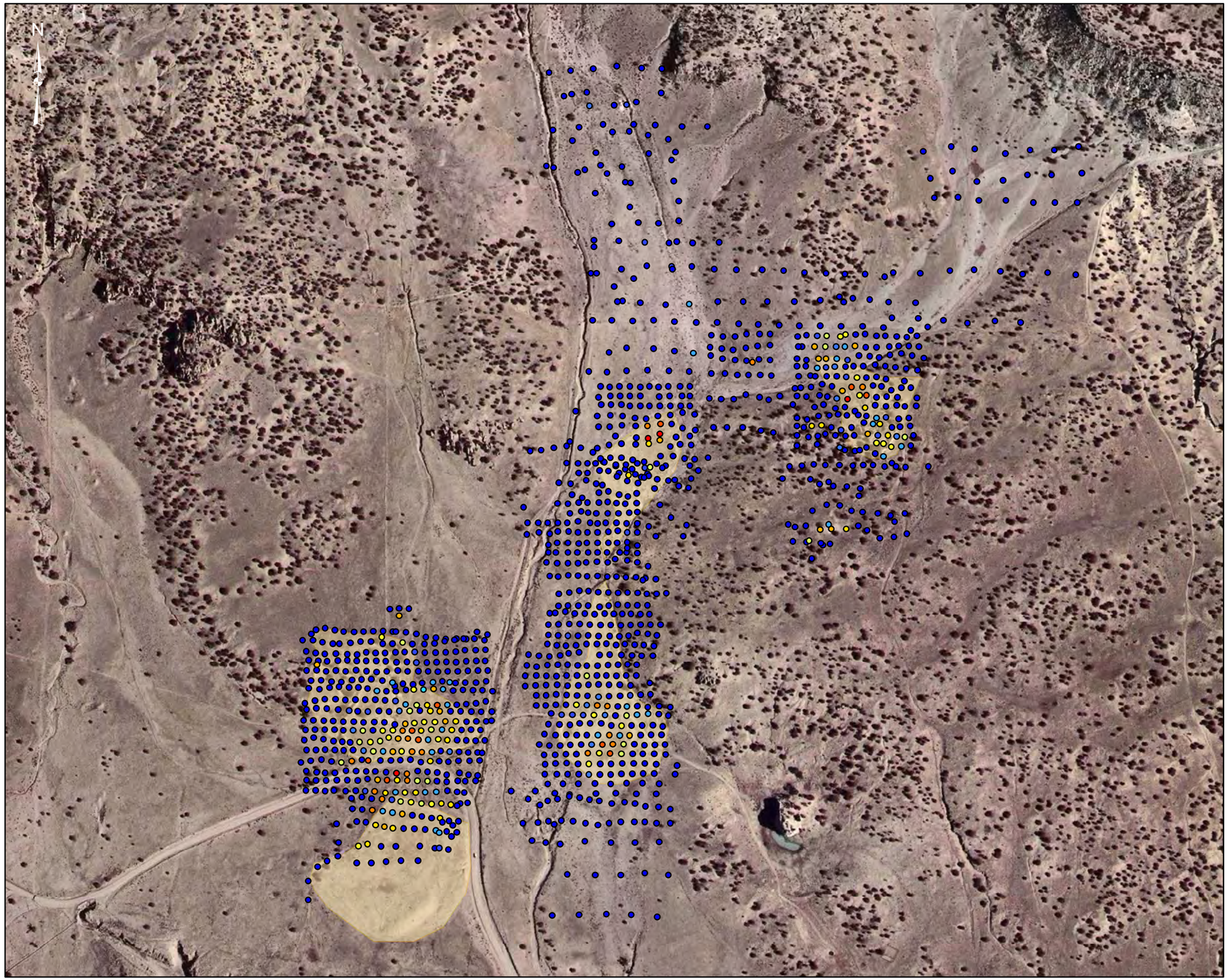
SCALE 1:6,000

PROJECT
EMNRD
AML URANIUM MINES
McKINLEY COUNTY, NEW MEXICO

TITLE
Ra-226 Concentrations
Field Correlation

Golder Associates
Albuquerque, New Mexico

PROJECT No. 073-80026			SCALE AS SHOWN	REV. 2
DESIGN	---	---	FIGURE 9	
GIS	JR	5/20/2009		
CHECK	FJ	5/20/2009		
REVIEW	BN	5/20/2009		



LEGEND

FieldData_AllFieldData_lowend

SOILwlow__pCi_g_

- 1.3 - 8.4
- 8.5 - 10.4
- 10.5 - 12.6
- 12.7 - 15.5
- 15.6 - 19.6
- 19.7 - 26.3
- 26.4 - 39.1
- 39.2 - 55.9
- 56.0 - 77.9
- 78.0 - 102.8
- 102.9 - 134.7
- 134.8 - 179.8
- 179.9 - 258.7
- 258.8 - 392.9
- 393.0 - 810.6

REFERENCE

1) Projection: Transverse Mercator Datum, NAD 83 Coordinate System.

200 0 200 Meters

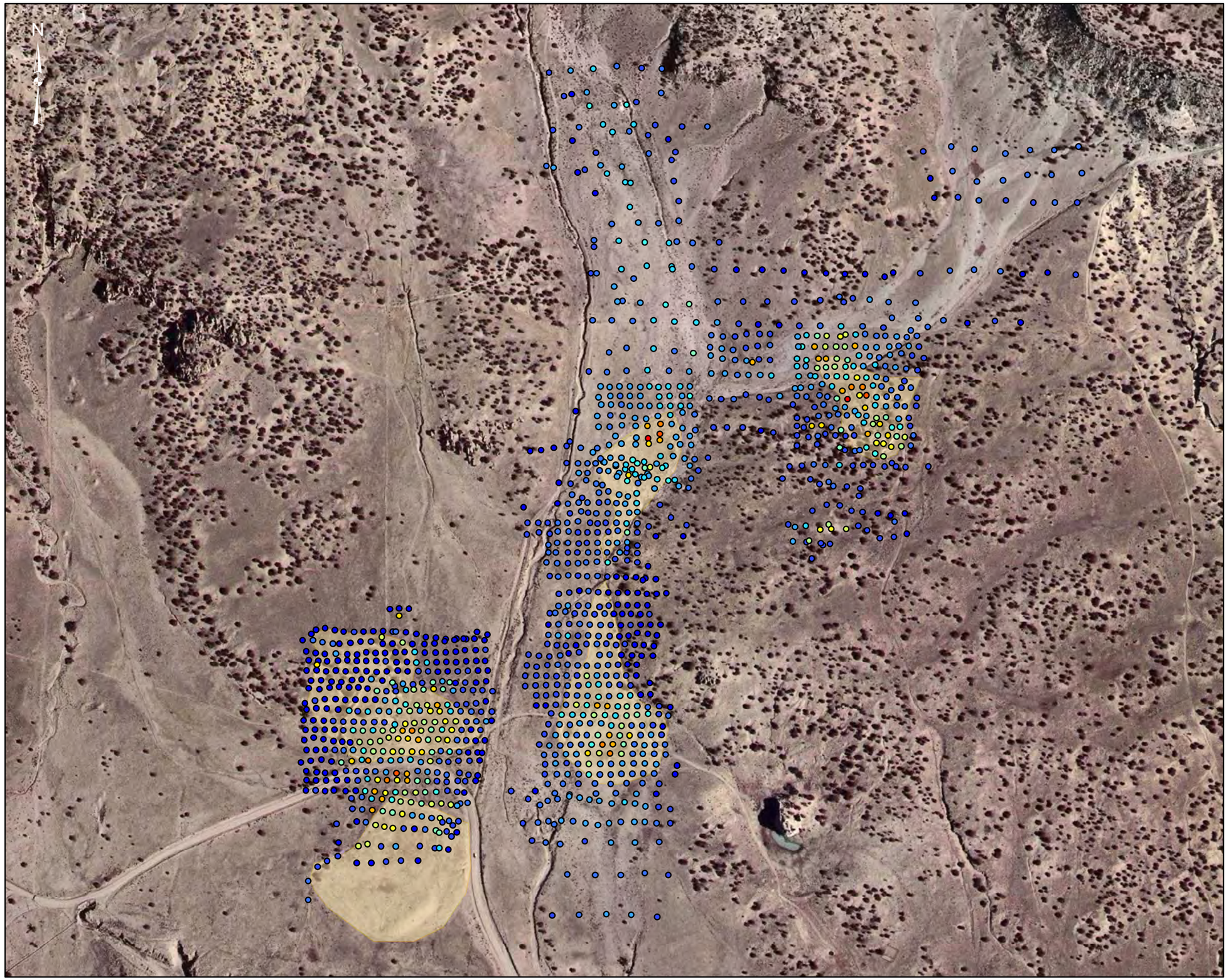
SCALE 1:6,000

PROJECT
EMNRD
AML URANIUM MINES
McKINLEY COUNTY, NEW MEXICO

TITLE
Ra-226 Concentrations
Field Correlation (Low-End Measurments)

Golder Associates
Albuquerque, New Mexico

PROJECT No. 073-80026			SCALE AS SHOWN	REV. 2
DESIGN	---	---	FIGURE 10	
GIS	JR	5/20/2009		
CHECK	FJ	5/20/2009		
REVIEW	BN	5/20/2009		



LEGEND

FieldData_AllCalibrationPadData

CAL_PAD_pCi_g

- 3.0 - 6.5
- 6.6 - 9.1
- 9.2 - 12.1
- 12.2 - 16.3
- 16.4 - 22.4
- 22.5 - 31.0
- 31.1 - 41.9
- 42.0 - 57.1
- 57.2 - 77.8
- 77.9 - 100.5
- 100.6 - 129.1
- 129.2 - 180.2
- 180.3 - 290.3
- 290.4 - 472.8
- 472.9 - 777.6

REFERENCE

1) Projection: Transverse Mercator Datum, NAD 83 Coordinate System.

200 0 200 Meters

SCALE 1:6,000

PROJECT
EMNRD
AML URANIUM MINES
McKINLEY COUNTY, NEW MEXICO

TITLE
Ra-226 Concentrations
Calibration Pad Correlation

Golder Associates
Albuquerque, New Mexico

PROJECT No. 073-80026			SCALE AS SHOWN	REV. 2
DESIGN	---	---	FIGURE 11	
GIS	JR	5/20/2009		
CHECK	FJ	5/20/2009		
REVIEW	BN	5/20/2009		

LEGEND

FieldData_UpperLimitFieldData

- FieldData_UpperLimitFieldData

Rad226_Contours

Id

- 5 - 30 pCi/g
- 30 - 887 pCi/g

REFERENCE

1) Projection: Transverse Mercator Datum, NAD 83 Coordinate System.

70 0 70 Meters

SCALE 1:1,900

PROJECT
EMNRD
AML URANIUM MINES
McKINLEY COUNTY, NEW MEXICO

TITLE
Ra-226 Concentration Contours
Upper Limit Field Correlation (BJ No. 2)

Golder Associates
Albuquerque, New Mexico

PROJECT No. 073-80026			SCALE AS SHOWN	REV. 2
DESIGN	---	---		
GIS	JR	5/20/2009		
CHECK	FJ	5/20/2009		
REVIEW	BN	5/20/2009		

FIGURE 12

ATTACHMENT A

Calibration Pad Certificates and Calibration Pad Data

Abandoned Uranium Mine Land-Poison Canyon

07380026

ACCEPTABLE COUNT RANGE

LOCATION: 39°33'46"/109°24'26" NAD 27 DATE: 3.16.

METER TYPE: 2350-1 PERFORMED BY: _____

METER ID #: 255240

DETECTOR TYPE: 44-10

DETECTOR ID #: PR 273159

H.V. /THRESHOLD 950 T=100

CALIB. DATE: 1-9-09

SOURCE TYPE: Cs-137

SOURCE #: 189499 105

ACTIVITY (uCi): uCi

NUMBER	BKG CPS
1	444
2	481
3	454
AVG BKG	460

NUMBER	SOURCE CPS
1	16244
2	22047
3	19367
4	20401
5	20805
6	22273
7	21661
8	20602
9	20452
10	22910
AVG SOURCE	20664

ACR [(AVG SOURCE)-(AVG BKG)]:

HIGH ACR (+ 10 %): 22730.2

LOW ACR (-10 %): 16598

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)
3/16/09	[illegible]	950	465	485	487	479	21993	22047	22008		21544 ✓
3/17/09	[illegible]	950	442	439	493	458	23779	22241	21965		22206 ✓
3/18/09	[illegible]	950	506	439	516	487	21304	21340	21807	21484	20997 ✓
3/19/09	[illegible]	950	471	449	434	451	21453	22153	21954	21953	21502 ✓

Abandoned Uranium Mine Land-Poison Canyon
07380026

ACCEPTABLE COUNT RANGE

LOCATION: Barbara S #3 3913625/2426420 DATE: 4/2/09
METER TYPE: 2350-1 PERFORMED BY: MDH
METER ID #: 255840
DETECTOR TYPE: 44-10
DETECTOR ID #: PR277157
H.V. /THRESHOLD 950
CALIB. DATE: 1-7-09
SOURCE TYPE: Cs-137
SOURCE #: 105
ACTIVITY (uCi): 1uCi

NUMBER	BKG CPS
1	
2	3.16.09
3	
AVG BKG	3

NUMBER	SOURCE CPS
1	
2	
3	
4	3.16.09
5	
6	
7	3
8	
9	
10	
AVG SOURCE	

ACR [(AVG SOURCE)-(AVG BKG)]:
HIGH ACR (+ 10 %): 23302
LOW ACR (-10 %): 18598

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)
4/2/09		950	430	482	453	455	19363	23910	22713	21495	21040

Abandoned Uranium Mine Land-Poison Canyon

07380026

LOCATION: ABD WAREHOUSE? DATE: 3.19.09

METER SERIAL # 182652 PERFORMED BY: Diane

BATT LIFE: OK

CALIB. DATE: 4-8-08

SOURCE TYPE: Co-137

SOURCE #: 105

ACTIVITY (uCi): 1

REPLICATE/SCALE	BACK GROUND COUNTS
1	14
2	15
3	14.5
AVG BKG	14.5

ACCEPTABLE COUNT RANGE

REPLICATE/SCALE	ACCEPTABLE COUNT RANGE SOURCE CPS					
	25	50	250	500	5000	25
1	[illegible]	38	90			19
2	[illegible]	39	100			19.5
3	[illegible]	39	95			19
4	[illegible]	40	95			19
5	[illegible]	41	95			19
AVG SOURCE:		39.4	95			19.1
ACR [(AVG SOURCE)-(AVG BKG)]:		24.9	80.5			4.6
HIGH ACR (+ 10 %):		27.4	88.6			4.1
LOW ACR (-10 %):		22.4	72.5			5.1

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	BACKGROUND CPM				@12" @4" SOURCE COUNTS				
		1	2	3	AVG BKG	25	50	250	500	5000
		15	15	15	15	19	39	95		
					(SOURCE)-(AVG BKG)	4	24	80		
4/2/09	LuDMa	13	14	14	13.6	18.5	40.5	100		
					(SOURCE)-(AVG BKG)	4.9	26.9	86.4		
					(SOURCE)-(AVG BKG)					

✓ Diane

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum MicroR Meter

ACR

1) Turn on instrument and visibly inspect for damages. Verify battery life, record date, location (site or group of sites), meter model and serial #, high voltage (H.V.) setting, calbiration date, source type, # and activity and name of individual performing checks.

2) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances. Record (3) background counts with selector in the 25 position, obtain an average.

5) Position meter horizontally away from known radioactive check source until needle measures 2/3rd of the 25 setting's range on the scale, record 5 source counts and obtain an average.

6) Move dial to next setting (50), position meter closer to the source to achieve 2/3rd the setting range, record 5 source counts and obtain and average.

7) Repeat step 6 for each setting (ie. 250, 500 and 5000), positioning the meter closer to the source each time.

8) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE) for each setting.

9) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count for each setting . These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.

10) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, operator initials, and verify battery life .

2) Record 3 background counts at the 25 setting **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.

3) Record a single source count for each setting (ie. 25, 50, 250, 500 and 5000) when the needle measures 2/3rds of setting's scale (See steps 5 and 6 for ACR above).

4) Subtract the average background count from each settings source count.

5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR (above) for each setting. The DQC should fall within this range.

6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, tag the instrument out of service, otherwise proceed as normal

Abandoned Uranium Mine Land-Poison Canyon

07380026

ACCEPTABLE COUNT RANGE

LOCATION: ABQ WAREHOUSE

DATE: 3.19.09

METER TYPE: 2221

PERFORMED BY: Tina

METER ID #: 108859

DETECTOR TYPE: 44-10

DETECTOR ID #: PR114540

H.V. /THRESHOLD: 859/105

CALIB. DATE: 3-2-09

SOURCE TYPE: Cs-137

SOURCE #: 135

ACTIVITY (uCi): 1

NUMBER	BKG CPS
1	401
2	399
3	415
AVG BKG	405

NUMBER	SOURCE CPS
1	12926
2	12767
3	12893
4	13006
5	12926
6	12878
7	12978
8	13020
9	12963
10	12773
AVG SOURCE	12913

ACR [(AVG SOURCE)-(AVG BKG)]:

HIGH ACR (+ 10 %): 14204

LOW ACR (-10 %): 11622

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)
3.19.09	Tina	859	395	375	407	392	12061	12079	12079	12073	11681 ✓

•Abandoned Uranium Mine Land-Poison Canyon
07380026

ACCEPTABLE COUNT RANGE

LOCATION: ABQ WAREHOUSE DATE: 3.19.09
METER TYPE: 2350-1 PERFORMED BY: JMM2
METER ID #: 255840
DETECTOR TYPE: 44-10
DETECTOR ID #: PR273159
H.V. /THRESHOLD 950 T=100
CALIB. DATE: 1-16-09
SOURCE TYPE: Cs-137
SOURCE #: 105
ACTIVITY (uCi): 1

NUMBER	BKG CPS
1	584
2	533
3	516
AVG BKG	544

NUMBER	SOURCE CPS
1	23101
2	22481
3	22148
4	21735
5	22040
6	20713
7	19312
8	23130
9	21856
10	21915
AVG SOURCE	21893

ACR [(AVG SOURCE)-(AVG BKG)]:
HIGH ACR (+ 10 %): 24082
LOW ACR (-10 %): 19704

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)	
3.19.09	JMM2	950	512	556	530	533	22603	21612	20968	21494	20961	✓
3.26.09	JMM2	950	450	475	480	468	20356	20251	21216	21274	20806	✓
4/3/09	JMM2	950	469	548	513	510	22192	21859	22483	22178	21668	✓

Abandoned Uranium Mine Land-Poison Canyon

07380026

LOCATION: ABQ WAREHOUSE DATE: 3.19.09

METER SERIAL # 253053 PERFORMED BY: JDM

BATT LIFE: OK

CALIB. DATE: 8-20-09

SOURCE TYPE: Co-137

SOURCE #: 105

ACTIVITY (uCi): 1

REPLICATE/SCALE	BACK GROUND COUNTS
1	13
2	13
3	13
AVG BKG	13

ACCEPTABLE COUNT RANGE

REPLICATE/SCALE	ACCEPTABLE COUNT RANGE SOURCE CPS				
	8" 25	3" 50	250	500	5000
1	22	42	85		
2	21	42	90		
3	22	42	80		
4	22	42	85		
5	21	42	80		
AVG SOURCE:	21.6	42	84		
ACR [(AVG SOURCE)-(AVG BKG)]:	8.6	29	71		
HIGH ACR (+ 10 %):	9.5	31.9	78.1		
LOW ACR (-10 %):	7.7	26.1	64.0		

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	BACKGROUND CPM 1	2	3	AVG BKG	SOURCE COUNTS 25	50	250	500	5000
3.19.09	AJ	12.5	13	13	12.8	22	42	85		
					(SOURCE)-(AVG BKG)	9.2	29.2	72.2		
					(SOURCE)-(AVG BKG)					
					(SOURCE)-(AVG BKG)					

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum MicroR Meter

ACR

1) Turn on instrument and visibly inspect for damages. Verify battery life, record date, location (site or group of sites), meter model and serial #, high voltage (H.V.) setting, calbiration date, source type, # and activity and name of individual performing checks.
2) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances. Record (3) background counts with selector in the 25 position, obtain an average.
5) Position meter horizontally away from known radioactive check source until needle measures 2/3rd of the 25 setting's range on the scale, record 5 source counts and obtain an average.
6) Move dial to next setting (50), position meter closer to the source to achieve 2/3rd the setting range, record 5 source counts and obtain and average.
7) Repeat step 6 for each setting (ie. 250, 500 and 5000), positioning the meter closer to the source each time.
8) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE) for each setting.
9) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count for each setting . These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
10) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, operator initials, and verify battery life .
2) Record 3 background counts at the 25 setting **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record a single source count for each setting (ie. 25, 50, 250, 500 and 5000) when the needle measures 2/3rds of setting's scale (See steps 5 and 6 for ACR above).
4) Subtract the average background count from each settings source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR (above) for each setting. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, tag the instrument out of service, otherwise record as normal

Abandoned Uranium Mine Land-Poison Canyon

07380026

LOCATION: 39136.25 / 24244.2

METER MODEL & SERIAL #: Model 19 / 25353

DATE: 4/2/06

PERFORMED BY: [illegible]

BATT LIFE: OK

CALIB. DATE: 8.20.08

SOURCE TYPE: Cs-137

SOURCE #: 105

ACTIVITY (uCi): [illegible]

REPLICATE/SCALE	BACK GROUND COUNTS
1	[illegible]
2	[illegible]
3	[illegible]
AVG BKG	3.16.09

ACCEPTABLE COUNT RANGE

REPLICATE/SCALE	ACCEPTABLE COUNT RANGE SOURCE CPS				
	25	50	250	500	5000
1					
2					
3		[illegible]	[illegible]		
4					
5		[illegible]			
AVG SOURCE:		3.			
ACR [(AVG SOURCE)-(AVG BKG)]:					
HIGH ACR (+ 10 %):	8.8	33	88		
LOW ACR (-10 %):	7.2	27	72		

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	BACKGROUND CPM 1	2	3	AVG BKG	SOURCE COUNTS 25	50	250	500	5000
4/2/09	[illegible]	12	12	12	12	18	45	90		
					(SOURCE)-(AVG BKG)	6	33	80		
					(SOURCE)-(AVG BKG)					
					(SOURCE)-(AVG BKG)					

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum MicroR Meter

ACR

1) Turn on instrument and visibly inspect for damages. Verify battery life, record date, location (GPS coordinates), meter model and serial #, high voltage (H.V.) setting, calbiration date, source type, # and activity and name of individual performing checks.
2) Select a location for establishing ACR and background(BKG). The location should reflect the lowest counts in an area and have few physical disturbances. Record (3) background counts with selector in the 25 position, obtain an average.
5) Position meter horizontally away from radioactive check source until needle measures 2/3rd of the 25 setting's range on the scale, record 5 source counts and obtain an average.
6) Move dial to next setting, position meter closer to the source to achieve 2/3rd the setting range, record 5 source counts and obtain and average.
7) Repeat step 6 for each setting, positioning the meter closer to the source each time.
8) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE) for each setting.
9) Determine ACR by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count for each setting . These values represent and ACR one can expect when conducting daily quality control checks for a given location.
10) Establish an ACR for each probe/meter combo and location/site.

DQC

1) Record the date, operator initials, and verify battery life at each use.
2) Record 3 background counts for the 25 setting at location were ACR was performed, obtain an average background count.
3) Record a single source count for each setting (ie. 25, 50, 250, 500 and 5000) when needle measures 2/3rds of setting's scale (See steps 5 and 6 for ACR above).
4) Subtract the average background count from each setting's source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR (above) for each setting. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, tag the instrument out of service, otherwise proceed as normal.

Abandoned Uranium Mine Land-Poison Canyon

07380026

LOCATION: 39 13 34.6 / 24 26.60 NAD 27 DATE: 3.16 12:45

METER SERIAL # 253055 PERFORMED BY: fiona

BATT LIFE: OK

CALIB. DATE: 8-20-08

SOURCE TYPE: Cs

SOURCE #: 105

ACTIVITY (uCi): 1uCi

REPLICATE/SCALE	BACK GROUND COUNTS
1	10
2	10
3	10
AVG BKG	10

ACCEPTABLE COUNT RANGE

REPLICATE/SCALE	ACCEPTABLE COUNT RANGE SOURCE CPS				
	25	50	250	500	5000
1	18	40	90		
2	18	40	90		
3	18	40	90		
4	18	40	90		
5	18	40	90		
AVG SOURCE:	18	40	90		
ACR [(AVG SOURCE)-(AVG BKG)]:	8	30	80		
HIGH ACR (+ 10 %):	8.8	33	88		
LOW ACR (-10 %):	7.2	27	72		

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	BACKGROUND CPM				8" 3" SOURCE COUNTS				
		1	2	3	AVG BKG	25	50	250	500	5000
3/16	fiona	11	10.5	10	10.5	17	38	80		
					(SOURCE)-(AVG BKG)	6.5	27.5	69.5		
3/17	fiona	13	13	13	13	20	43	85		
					(SOURCE)-(AVG BKG)	7	30	72		
3/18	fiona	11	12	13	12	21	38	90		
39 13 46 / 24 26 00					(SOURCE)-(AVG BKG)	9	26	78		
3/19	fiona	12	13	13	12.7	23	42	90		
						10	29	77		

too low

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum MicroR Meter

ACR

1) Turn on instrument and visibly inspect for damages. Verify battery life, record date, location (site or group of sites), meter model and serial #, high voltage (H.V.) setting, calbiration date, source type, # and activity and name of individual performing checks.

2) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances. Record (3) background counts with selector in the 25 position, obtain an average.

5) Position meter horizontally away from known radioactive check source until needle measures 2/3rd of the 25 setting's range on the scale, record 5 source counts and obtain an average.

6) Move dial to next setting (50), position meter closer to the source to achieve 2/3rd the setting range, record 5 source counts and obtain and average.

7) Repeat step 6 for each setting (ie. 250, 500 and 5000), positioning the meter closer to the source each time.

8) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE) for each setting.

9) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count for each setting . These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.

10) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, operator initials, and verify battery life .

2) Record 3 background counts at the 25 setting **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.

3) Record a single source count for each setting (ie. 25, 50, 250, 500 and 5000) when the needle measures 2/3rds of setting's scale (See steps 5 and 6 for ACR above).

4) Subtract the average background count from each settings source count.

5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR (above) for each setting. The DQC should fall within this range.

6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, tag the instrument out of service, otherwise proceed as normal.

Abandoned Uranium Mine Land-Poison Canyon
07380026

ACCEPTABLE COUNT RANGE

LOCATION: 242639 / 3913628 DATE: 4/15/08
METER TYPE: 2221 PERFORMED BY: Jones & Rob
METER ID #: 115157
DETECTOR TYPE: 44-10
DETECTOR ID #: PR114540
H.V. /THRESHOLD 1151 857
CALIB. DATE: 3/5/09
SOURCE TYPE: Cs137
SOURCE #: 1698-03
ACTIVITY (uCi): 5.0

NUMBER	BKG CPS
1	225
2	239
3	244
AVG BKG	236

NUMBER	SOURCE CPS
1	28341 w/source in box closed
2	28353
3	28553
4	28741
5	26458
6	27390
7	27085
8	27138
9	26948
10	27343
AVG SOURCE	27635

ACR [(AVG SOURCE)-(AVG BKG)]: 27399
HIGH ACR (+ 10 %): 30139
LOW ACR (-10 %): 24659

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)
4/15/09	[illegible]		248	273	226	249	27280	28058	26176	27104	26856

Abandoned Uranium Mine Land-Poison Canyon

07380026

LOCATION:

DATE: 4/15/09

METER MODEL & SERIAL # 19 (182652)

PERFORMED BY:

BATT LIFE: OK

CALIB. DATE: 4/28/08

SOURCE TYPE: Cs-137

SOURCE #:

ACTIVITY (uCi): 5μCi

REPLICATE/SCALE	BACK GROUND COUNTS
1	11
2	10
3	12
AVG BKG	11

ACCEPTABLE COUNT RANGE

source was contained in box

REPLICATE/SCALE	ACCEPTABLE COUNT RANGE SOURCE CPS				
	(20") 25	(8") 50	0" 250	500	5000
1	18	38	200		
2	20	38	200		
3	19	40	210		
4	20	37	200		
5	19	39	200		
AVG SOURCE:	19.2	38.4	202		
ACR [(AVG SOURCE)-(AVG BKG)]:	8.2	27.4	191		
HIGH ACR (+ 10 %):	9.0	30.1	210.1		
LOW ACR (-10 %):	7.4	24.7	172		

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	BACKGROUND CPM 1	2	3	AVG BKG	SOURCE COUNTS 25	50	250	500	5000
		10	11	11	10.7	17	38	190		
					(SOURCE)-(AVG BKG)	6.3	27.3	179		
					(SOURCE)-(AVG BKG)					
					(SOURCE)-(AVG BKG)					
					(SOURCE)-(AVG BKG)					

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum MicroR Meter

ACR

1) Turn on instrument and visibly inspect for damages. Verify battery life, record date, location (GPS coordinates), meter model and serial #, high voltage (H.V.) setting, calbiration date, source type, # and activity and name of individual performing checks.
2) Select a location for establishing ACR and background(BKG). The location should reflect the lowest counts in an area and have few physical disturbances. Record (3) background counts with selector in the 25 position, obtain an average.
5) Position meter horizontally away from radioactive check source until needle measures 2/3rd of the 25 setting's range on the scale, record 5 source counts and obtain an average.
6) Move dial to next setting, position meter closer to the source to achieve 2/3rd the setting range, record 5 source counts and obtain and average.
7) Repeat step 6 for each setting, positioning the meter closer to the source each time.
8) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE) for each setting.
9) Determine ACR by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count for each setting . These values represent and ACR one can expect when conducting daily quality control checks for a given location.
10) Establish an ACR for each probe/meter combo and location/site.

DQC

1) Record the date, operator initials, and verify battery life at each use.
2) Record 3 background counts for the 25 setting at location were ACR was performed, obtain an average background count.
3) Record a single source count for each setting (ie. 25, 50, 250, 500 and 5000) when needle measures 2/3rds of setting's scale (See steps 5 and 6 for ACR above).
4) Subtract the average background count from each setting's source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR (above) for each setting. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, tag the instrument out of service, otherwise proceed as normal.

M-19

Abandoned Uranium Mine Land-Poison Canyon
07380026

TOUCHSTONE

LOCATION: CAL PLOTS
METER SERIAL #: 152652
BATT LIFE: OK
CALIB. DATE: 3/16/09
SOURCE TYPE: CS
SOURCE #: 105
ACTIVITY (uCi): 1

DATE: 3/16/09
PERFORMED BY: RB

REPLICATE/SCALE	BACK GROUND COUNTS	
1	14	13
2	14	12
3	16	14
AVG BKG	14.6	13

ACCEPTABLE COUNT RANGE

REPLICATE/SCALE	ACCEPTABLE COUNT RANGE SOURCE CPS					
	25	50	250	25 ~~500~~	50 ~~5000~~	250
1	20	38	100	19	44	170
2	20	40	110	20	44	180
3	18	40	110	19	45	180
4	20	40	110	20	45	175
5	19	40	110	21	46	185
AVG SOURCE:	19.4	39.5	108	20	~~44~~ 45	178
ACR [(AVG SOURCE)-(AVG BKG)]:	4.8	24.9	93.4	7	~~25~~ 32	165
HIGH ACR (+ 10 %):	~~21.34~~	~~43.45~~	~~118.8~~	8	35	182
LOW ACR (-10 %):	~~17.46~~	~~35.55~~	~~97.2~~	6	29	149

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	BACKGROUND CPM 1	2	3	AVG BKG	SOURCE COUNTS 25	50	250	500	5000
DOE 3/16/09	JAC/FJ	18	15	16	15	22	44	110	~~35~~	
					(SOURCE)-(AVG BKG)	~~7~~	29	95		
BJ #2 3/16/09	JAC/RB	26	26	26	26	28	48	110		
					(SOURCE)-(AVG BKG)	2	22	84		
3/17/09	JAC/RB	12	13	14	13	20	43	180		
					(SOURCE)-(AVG BKG)	7	80	167		
3/18/09	JAC	12	14	14	~~13~~	18	42	165		
3/19/09 4000		13	13	14	13	5	29	152		

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum MicroR Meter

ACR 3/19 17 40 180
4 27 167 391344/2412600

1) Turn on instrument and visibly inspect for damages. Verify battery life, record date, location (site or group of sites), meter model and serial #, high voltage (H.V.) setting, calbiration date, source type, # and activity and name of individual performing checks.
2) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances. Record (3) background counts with selector in the 25 position, obtain an average.
5) Position meter horizontally away from known radioactive check source until needle measures 2/3rd of the 25 setting's range on the scale, record 5 source counts and obtain an average.
6) Move dial to next setting (50), position meter closer to the source to achieve 2/3rd the setting range, record 5 source counts and obtain and average.
7) Repeat step 6 for each setting (ie. 250, 500 and 5000), positioning the meter closer to the source each time.
8) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE) for each setting.
9) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count for each setting . These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
10) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, operator initials, and verify battery life .
2) Record 3 background counts at the 25 setting **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record a single source count for each setting (ie. 25, 50, 250, 500 and 5000) when the needle measures 2/3rds of setting's scale (See steps 5 and 6 for ACR above).
4) Subtract the average background count from each settings source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR (above) for each setting. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, tag the instrument

Background Location @ BJ #2
S side of Road @ drainage
35° 19' 34.673 S N UTM 83
107° 49' 57.249 S W

Abandoned Uranium Mine Land-Poison Canyon

07380026

LOCATION: Calibration pads

DATE: 3·16·08

METER SERIAL # 253053

PERFORMED BY: tionza Bethel + 1213

BATT LIFE: OK

CALIB. DATE: 8-20-08

SOURCE TYPE: Cs-137

SOURCE #: 105

ACTIVITY (uCi): 1

REPLICATE/SCALE	BACK GROUND COUNTS
1	15
2	15
3	15.75
AVG BKG	15.08

ACCEPTABLE COUNT RANGE

ACCEPTABLE COUNT RANGE SOURCE CPS

REPLICATE/SCALE	25	50	250	500	5000
1	18	38	90	///	///
2	19	38	90	///	///
3	20	39	90	///	
4	19	38	95	///	///
5	20	39	95	///	///
AVG SOURCE:	19.2	38.4	92	///	///
ACR [(AVG SOURCE)-(AVG BKG)]:	4.12	23.32	76.92	///	///
HIGH ACR (+ 10 %):	24.5	25.6	123.6	///	///
LOW ACR (-10 %):	13.6	20.9	69.3	///	///

not able to get these measurements =

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	BACKGROUND CPM 1	2	3	AVG BKG	SOURCE COUNTS 25	50	250	500	5000
		10	10	9		18	42	90		
	3/13/3/6 3/26/08 JC				(SOURCE)-(AVG BKG)	9	27	80		
					(SOURCE)-(AVG BKG)					
					(SOURCE)-(AVG BKG)					

@3" @36" Contact

23.32
2.32
25.65
20.99
76.92
7.7
83.67

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum MicroR Meter

ACR

1) Turn on instrument and visibly inspect for damages. Verify battery life, record date, location (site or group of sites), meter model and serial #, high voltage (H.V.) setting, calbiration date, source type, # and activity and name of individual performing checks.
2) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances. Record (3) background counts with selector in the 25 position, obtain an average.
5) Position meter horizontally away from known radioactive check source until needle measures 2/3rd of the 25 setting's range on the scale, record 5 source counts and obtain an average.
6) Move dial to next setting (50), position meter closer to the source to achieve 2/3rd the setting range, record 5 source counts and obtain and average.
7) Repeat step 6 for each setting (ie. 250, 500 and 5000), positioning the meter closer to the source each time.
8) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE) for each setting.
9) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count for each setting . These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
10) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, operator initials, and verify battery life .
2) Record 3 background counts at the 25 setting **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record a single source count for each setting (ie. 25, 50, 250, 500 and 5000) when the needle measures 2/3rds of setting's scale (See steps 5 and 6 for ACR above).
4) Subtract the average background count from each settings source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR (above) for each setting. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, tag the instrument

Abandoned Uranium Mine Land-Poison Canyon

07380026

ACCEPTABLE COUNT RANGE

LOCATION: CALIBRATION PAD DATE: 3-16-09

METER TYPE: 2350-1 PERFORMED BY: Tina

METER ID #: 255840

DETECTOR TYPE: 44-10

DETECTOR ID #: PR273159

H.V. /THRESHOLD 950 T=100

CALIB. DATE: 1-9-09

SOURCE TYPE: Cs-137

SOURCE #: 105

ACTIVITY (uCi): 1

NUMBER	BKG CPS
1	625
2	~~788~~ 788
3	783
AVG BKG	715

@6" SOURCE

NUMBER	CPS
1	23058 @source
2	23937
3	23137
4	23220
5	23163
6	23382
7	23948
8	23601
9	23282
10	23577
AVG SOURCE	23437

1557 1409
1554 1553
1555
1570
1483
1494
1407
1358

ACR [(AVG SOURCE)-(AVG BKG)]:

HIGH ACR (+ 10 %): 25751

LOW ACR (-10 %): 21094

@12"
874
939
903
820
817
863
918
835
842
895

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR **MUST** be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)
3/16/09	JAC	950	676	558	643	626	21888	21895	21465	21749	21123

Abandoned Uranium Mine Land-Poison Canyon

07380026

ACCEPTABLE COUNT RANGE

LOCATION: DOE Pad DATE: 3/16/09

METER TYPE: Ludlum 2221 PERFORMED BY: JAC

METER ID #: 108859

DETECTOR TYPE: NaI

DETECTOR ID #: PR 114540

H.V. /THRESHOLD 858/105

CALIB. DATE: 3/2/09

SOURCE TYPE: Cs

SOURCE #: 105

ACTIVITY (uCi): 1

NUMBER	Not Shielded BKG CPS	@ DOE Shielded
1	1548	597
2	1549	533
3	1588	583
AVG BKG	1561.7 ⇒ 1562	

NUMBER	SOURCE CPS	BJ 3/17 Daily
1	14027	12583
2	14268	12536
3	14075	12676
4	14348	12368
5	14204	12638
6	14089	12411
7	14072	12747
8	14272	12525
9	14239	12778
10	14314	12632
AVG SOURCE	14190	12579

ACR [(AVG SOURCE)-(AVG BKG)]:

HIGH ACR (+ 10 %): 15609 13837

LOW ACR (-10 %): 12772 11321

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

6in
1540
1556
1509
1516
1560
1465
1537
1528
1610
1519

12in
~~776~~ 760
798
740
831
781
697
755
772
776
763

18in

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)
3/16/09	JAC	858	556	599	583	579	14120	13873	14334	14109	13526
3/16/09	JAC	"	678	620	677	658	12959	12896	12807	12887	12229 EH
	"	"	627	596	572	598	12699	12557	12700		12054 ~~FH~~
3/17/09	JAC/RB	868	408	414	406	409	12987	13075	12941	12991	12582 ✓
3/18/09	JAC/RB	861	393	400	383	392	13087	12813	12741	12881	12489 ✓
3/19/09	JAC/RB	870	367	361	379	362	14280	14263	14244	14263	13901 ✓

Doe Shielded 2

BATT

OK.

5.8

Abandoned Uranium Mine Land-Poison Canyon

07380026

ACCEPTABLE COUNT RANGE

LOCATION: Calibration pad

DATE: 4/15/08

METER TYPE: 2221

PERFORMED BY: Tobye Ogden

METER ID #: 115154

2:05pm

DETECTOR TYPE: 44-10

DETECTOR ID #: PR114540

H.V. /THRESHOLD 115/857

CALIB. DATE: 3-5-07

SOURCE TYPE: Cs-137

SOURCE #: 1698-03

ACTIVITY (uCi): 5.0

NUMBER	BKG CPS
1	447
2	437
3	465
AVG BKG	450

NUMBER	SOURCE CPS
1	28418
2	28303
3	28562
4	28240
5	28606
6	28475
7	28345
8	28617
9	28895
10	28451
AVG SOURCE	28491

ACR [(AVG SOURCE)-(AVG BKG)]: 28041

HIGH ACR (+ 10 %): 30845

LOW ACR (-10 %): 25237

Acceptable Count Range (ACR) and Daily Quality Control Check (DQC) Procedures for Ludlum 44-10/44-9 and Model 2350/2221/12

ACR

1) Turn on instrument and visibly inspect meter and probe for damage especially to cables, probe's glass casing and digital display. Verify battery life.
2)Record date, location (site or group of sites with coordinates), model and serial #, detector model & serial #, high voltage (H.V.) threshold settings, calbiration date, source type, # and activity and name of individual performing checks.
3) Select a location for establishing ACR and background(BKG). The location should reflect the lowest count in an area and have few physical disturbances such as waste piles, shafts and mining-associated debris.
4) Record (3) six second background counts (CPS) and obtain an average.
5) Hold probe vertically above a known radioactive check source.
6) Record (10) six second source counts and obtain an average count.
7) Subtract the average background count (AVG BKG) from the average source count (AVG SOURCE).
8) Determine the accepatable count range (ACR) by subtracting 10 % (low) from and adding 10 % (high) to the average source minus backgrond count. These values represent the acceptable count range one can expect when conducting daily quality control checks for a given location.
9) An ACR MUST be established for each probe/meter combo and location/site.

DQC

1) Daily, record the date, high voltage and operator initials.
2) Record (3) six second background counts **AT THE SAME LOCATION** that the ACR was performed and obtain an average background count.
3) Record (3) six second source counts with the probe held above the known (same distance as above) source and obtain an average source count.
4) Subtract the average background count from the average source count.
5) Compare the (AVG SOURCE)-(AVG BKG) count to the high and low ACR. The DQC should fall within this range.
6) If the instrument fails to fall within the ACR established for a given location evaluate conditions to insure no changes in background, source, etc. occured and perform a second ACR and DQC. If the instrument fails again, If warranted, tag the instrument Out of Service and send to manufacturer for repair.
7) If second DQC falls within second ACR, proceed.

DAILY QUALITY CONTROL CHECK

DATE	INITIAL	H.V.	BACKGROUND CPM			AVG BKG	SOURCE CPM			AVG SOURCE	(AVG SOURCE)-(AVG BKG)
4/15/08	4/15/08	857	520 454	479	422	469	28516	28597	28445	28506	28037 ✓

Certificate of Calibration

Ratemeter / Scaler Certificate of Calibration

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2221 Serial No.: 115157

All Ranges Calibrated Electronically; Ludlum Pulser Generator Serial No.: ☐ 97743 ☑ 201932

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☑ Meter Zeroed ☑ Geotropism ck. ☑ F/S Response ck. ☑ Audio ck.

☑ THR/WIN ck. High Voltage ck.: ☑ 500v ☑ 1000v ☑ 1500v ☑ Battery ck. (min 4.4 vdc)

Threshold Setting: 10 mV

Instrument found within tolerance (+/- 10%) ☑ Yes ☐ No

Reference Calibration Point	Instrument "As Found Reading"	Instrument Meter Reading
400 Kcpm	400 Kcpm	400 Kcpm
100 Kcpm	100 Kcpm	100 Kcpm
40 Kcpm	40 Kcpm	40 Kcpm
10 Kcpm	10 Kcpm	10 Kcpm
4 Kcpm	4 Kcpm	4 Kcpm
1 Kcpm	1 Kcpm	1 Kcpm
400 cpm	400 cpm	400 cpm
100 cpm	100 cpm	100 cpm

Reference Calibration Point	Instrument "As Found Reading"	Log Scale Count Rate	Integrated Counts (1-minute count)
400 Kcpm	400 Kcpm	400 Kcpm	398735
40 Kcpm	40 Kcpm	40 Kcpm	39872
4 Kcpm	4 Kcpm	4 Kcpm	3987
400 cpm	400 cpm	400 cpm	399

Calibrated By: [signature] Calibration Date: 9.2.08

Calibration Due: 9.2.09

Reviewed By: [signature] Date: 9/2/08

ERG Form 1.02B

Certificate of Calibration

Ratemeter / Scaler Certificate of Calibration

ERG
Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2221r Serial No.: 86306

All Ranges Calibrated Electronically; Ludlum Pulser Generator Serial No.: ☐ 97743 ☑ 201932

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☑ Meter Zeroed ☑ Geotropism ck. ☑ F/S Response ck. ☑ Audio ck.

☑ THR/WIN ck. High Voltage ck.: ☑ 500v ☑ 1000v ☑ 1500v ☑ Battery ck. (min 4.4 vdc)

Threshold Setting: 10 mV

Instrument found within tolerance (+/- 10%) ☑ Yes ☐ No

Reference Calibration Point	Instrument "As Found Reading"	Instrument Meter Reading
400 Kcpm	400 Kcpm	400 Kcpm
100 Kcpm	100 Kcpm	100 Kcpm
40 Kcpm	40 Kcpm	40 Kcpm
10 Kcpm	10 Kcpm	10 Kcpm
4 Kcpm	4 Kcpm	4 Kcpm
1 Kcpm	1 Kcpm	1 Kcpm
400 cpm	400 cpm	400 cpm
100 cpm	100 cpm	100 cpm

Reference Calibration Point	Instrument "As Found Reading"	Log Scale Count Rate	Integrated Counts (1-minute count)
400 Kcpm	400 Kcpm	400 Kcpm	398320
40 Kcpm	40 Kcpm	40 Kcpm	39824
4 Kcpm	4 Kcpm	4 Kcpm	3983
400 cpm	400 cpm	400 cpm	398

Calibrated By: [signature] Calibration Date: 12-15-08

Calibration Due: 12-15-09

Reviewed By: [signature] Date: 12/15/08

Certificate of Calibration

Voltage Plateau Form

ERG
Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 44-10 Serial No.: PR122628

Counter Mfg.: Ludlum Model: 2221 Serial No.: 108846

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

Counter Threshold Setting: 10 mV Cable Length: ☐ 39 inch, ☐ 5 foot, ☑ Other: Curly

Detector geometry to source: ☐ Face, ☑ Side, ☐ Below, ☐ Other:

Distance to source: ☐ Contact, ☑ 6-Inches, ☐ Other: 1/2"

Alpha Source : ☐ Th230 @ 13,000 dpm (2/14/08) sn: 4098-03 ☐ Other:

Beta Source: ☐ Tc99 @ 16,800 dpm (2/14/08) sn: 4099-03 ☐ Other:

Gamma Source : ☑ Cs-137 @ 5.81µCi (3/07/07) sn: 4097-03 ☐ Other: Am-241 1µCi

Count Time: 1 Minute

High Voltage	Gross Source Counts	Background Counts
700	66530	
800	77472	
900	81357	
1000	83078	
1050	83246	
1100	83455	11759
1150	83640	
1200	85308	

Comments: Recommended Operating High Voltage: 1100 volts

Calibrated By: Calibration Date: 12-15-08

Calibration Due: 12-15-09

Reviewed By: Date: 12/15/08

Certificate of Calibration

Voltage Plateau Form

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 44-10 Serial No.: PR114540

Counter Mfg.: Ludlum Model: 2221 Serial No.: 115157

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

Counter Threshold Setting: 10 mV Cable Length: ☑ 39 inch, ☐ 5 foot, ☐ Other:

Detector geometry to source: ☐ Face, ☑ Side, ☐ Below, ☐ Other:

Distance to source: ☐ Contact, ☑ 6-Inches, ☐ Other:

Alpha Source : ☐ Th230 @ 13,000 dpm (2/14/08) sn: 4098-03 ☐ Other:

Beta Source: ☐ Tc99 @ 16,800 dpm (2/14/08) sn: 4099-03 ☐ Other:

Gamma Source : ☑ Cs-137 @ 5.32µCi (2/18/09) sn: 4097-03 ☐ Other: Am-241 1 µCi

Count Time: 1 Minute

High Voltage	Gross Source Counts	Background Counts
700	73004	
800	78988	
850	81304	10744
900	81959	
950	82902	
1000	84292	
1050	88960	

Comments: Recommended Operating High Voltage: 850 volts

Calibrated By: Calibration Date: 4/13/09

Calibration Due: 4/13/10

Reviewed By: Date: 4/13/09

Designer and Manufacturer of Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CERTIFICATE OF CALIBRATION

CUSTOMER ERG (ENVIRO RES GRP) ORDER NO. 20107226/324704

Mfg. Ludlum Measurements, Inc. Model 19 Serial No. 182652

Mfg. _____ Model _____ Serial No. _____

Cal. Date 28-Apr-08 Cal Due Date 28-Apr-09 Cal. Interval 1 Year Meterface 202-016

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 30 % Alt 705.8 mm Hg

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☐ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 550 V Input Sens. 34 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

☐ HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
5000	4000 uR/hr	4000	4000
5000	1000 uR/hr	1000	1000
500	400 uR/hr = 72400 cpm	400	400
500	100 uR/hr	100	100
250	200 uR/hr = 34000 cpm	200	200
250	100 uR/hr	100	100
50	7240 cpm	40	40
50	1810 cpm	10	10
25	3400 cpm	20	20
25	850 cpm	5	5

*Uncertainty within ± 10% C.F. within ± 20%

50, 25 **Range(s) Calibrated Electronically**

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☑ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☐ Other _____

☑ m 500 S/N 238275 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 83750210

Calibrated By: James K. Mabrito Date 28-APR-08

Reviewed By: Rhonda Hamm Date 28 Apr 08

FORM C22A 01/29/2008

AC Inst. Only ☐ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed: _____

ATTACHMENT B

ACZ Laboratory Analytical Reports

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

April 28, 2009

Report to:
Bob Newcomer
Golder Associates, Inc.
5200 Pasadena, N.E. Suite C
Albuquerque, NM 87113

Bill to:
Toni Sanchez
Golder Associates, Inc.
5200 Pasadena NE Suite C
Albuquerque, NM 87113

cc: Fiona Jordan

Project ID: 07380026.0002
ACZ Project ID: L75211

Bob Newcomer:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 09, 2009. This project has been assigned to ACZ's project number, L75211. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan, version 12.0. The enclosed results relate only to the samples received under L75211. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 28, 2009. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J3-1A

ACZ Sample ID: ***L75211-01***
Date Sampled: *04/02/09 12:45*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Thorium, total (3050)	M6020 ICP-MS	2.4	B	*	mg/Kg	0.5	3	04/21/09 3:11	erf
Uranium, total (3050)	M6020 ICP-MS	2150		*	mg/Kg	3	10	04/21/09 18:07	erf

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	92.1		*	%	0.1	0.5	04/10/09 13:00	lwt

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/10/09 12:30	lwt
Crush and Pulverize	USDA No. 1, 1972							04/13/09 10:00	lwt
Digestion - Hot Plate	M3050B ICP-MS							04/14/09 9:35	lwt

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value.
	The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5)	EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6)	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995.

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Golder Associates, Inc.
Project ID: 07380026.0002

ACZ Project ID: ***L75211***

Solids, Percent CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262077													
WG262077PBS	PBS	04/10/09 13:00				U	%		99.9	100.1			
L75214-01DUP	DUP	04/10/09 13:00			95.1	93.96	%				1.2	20	

Thorium, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262507													
WG262507ICV	ICV	04/21/09 2:42	MS090326-1	.05		.0477	mg/L	95.4	90	110			
WG262507ICB	ICB	04/21/09 2:47				U	mg/L		-0.003	0.003			
WG262158PBS	PBS	04/21/09 3:06				U	mg/Kg		-1.5	1.5			
L75214-01MS	MS	04/21/09 3:34	MS090311-4	12.5	1.4	13.5	mg/Kg	96.8	75	125			
L75214-01MSD	MSD	04/21/09 3:48	MS090311-4	12.5	1.4	13.16	mg/Kg	94.1	75	125	2.55	20	

Uranium, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262537													
WG262537ICV	ICV	04/21/09 17:39	MS090326-1	.05		.04907	mg/L	98.1	90	110			
WG262537ICB	ICB	04/21/09 17:44				U	mg/L		-0.0003	0.0003			
WG262158PBS	PBS	04/21/09 18:03				U	mg/Kg		-0.15	0.15			
L75214-01MS	MS	04/21/09 18:31	MS090311-4	625	3000	3210	mg/Kg	33.6	75	125			M3
L75214-01MSD	MSD	04/21/09 18:45	MS090311-4	625	3000	3187.5	mg/Kg	30	75	125	0.7	20	M3

Golder Associates, Inc.

ACZ Project ID: ***L75211***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L75211-01	WG262537	Uranium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J3-1A
Locator:

ACZ Sample ID: ***L75211-01***
Date Sampled: *04/02/09 12:45*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Gross Alpha & Beta (3050) Prep Method:
M9310

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Gross Alpha	04/24/09 13:05		1400	39	2.2	pCi/g	*	bjl
Gross Beta	04/24/09 13:05		1700	27	4.5	pCi/g	*	bjl

Radium 226 (3050) Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226 (3050)	04/22/09 16:52		580	4	0.38	pCi/g	*	mwm

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Error(+/-)	Calculated sample specific uncertainty
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
LCL	Lower Control Limit, in % (except for LCSS, mg/Kg)
LLD	Calculated sample specific Lower Limit of Detection
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RER	Relative Error Ratio, calculation used for Dup. QC taking into account the error factor.
UCL	Upper Control Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

DUP	Sample Duplicate	MS/MSD	Matrix Spike/Matrix Spike Duplicate
LCSS	Laboratory Control Sample - Soil	PBS	Prep Blank - Soil
LCSW	Laboratory Control Sample - Water	PBW	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Matrix Spikes	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

H	Analysis exceeded method hold time.
R	Poor spike recovery accepted because the other spike in the set fell within the given limits.
T	High Replicate Error Ratio (RER) accepted because sample concentrations are less than 10x the MDL.
U	No nuclides detected above the Lower Limit of Detection (LLD)
V	High blank data accepted because sample concentration is 10 times higher than blank concentration
X	QC is out of control. See Case Narrative.
Z	Poor spike recovery is accepted because sample concentration is four times greater than spike concentration.

Method Prefix Reference

M	EPA methodology, including those under SDWA, CWA, and RCRA
SM	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995.
D	ASTM
RP	DOE
ESM	DOE/ESM

Comments

(1)	Solid matrices are reported on a dry weight basis.
(2)	Preparation method: "Method" indicates preparation defined in analytical method.
(3)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Radiochemistry QC Summary

Golder Associates, Inc.
Project ID: 07380026.0002

ACZ Project ID: ***L75211***

Alpha M9310 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262764																
WG262565PBS	PBS	04/24/09						.39	0.29	0.27			0.54			
WG262565LCSS	LCSS	04/24/09	RC081215-1	32.42				28	2.8	0.54	86.4	52	129			
L75211-01DUP	DUP-RER	04/24/09			1400	39	2.2	1200	37	2.3				3.72	2	RN
L75211-01DUP	DUP-RPD	04/24/09			1400	39	2.2	1200	37	2.3				15.4	20	RN
L75212-02MS	MS	04/24/09	RC081215-1	101.32	470	23	2.2	430	24	2.6	-39.5	52	129			M3

Beta M9310 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262764																
WG262565PBS	PBS	04/24/09						1.2	0.6	0.77			1.54			
WG262565LCSS	LCSS	04/24/09	PCN30789	40				39	2.6	1.6	97.5	65	104			
L75211-01DUP	DUP-RER	04/24/09			1700	27	4.5	1300	23	4.4				11.28	2	RC
L75214-01MS	MS	04/24/09	PCN30789	111.11	2300	31	4.5	2600	33	4.5	270	65	104			M3

Radium 226 (3050) M903.1 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262679																
WG262382PBS	PBS	04/22/09						-.01	0.19	0.48			0.96			
WG262382LCSS	LCSS	04/22/09	RC090209-1	47.83				53	1.5	0.6	110.8	44	128			
L75211-01DUP	DUP-RER	04/22/09			580	4	0.38	670	4.5	0.41				14.95	2	RN
L75211-01DUP	DUP-RPD	04/22/09			580	4	0.38	670	4.5	0.41				14.4	20	RN
L75214-01MS	MS	04/22/09	RC090209-1	47.83	980	5.9	0.48	1300	8.2	0.73	669	44	128			M3

Golder Associates, Inc.

ACZ Project ID: ***L75211***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L75211-01	WG262764	Gross Alpha	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.
		Gross Beta	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RC	For a solid matrix, the matrix duplicate precision assessment (RPD or RER) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG262679	Radium 226 (3050)	M903.1	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M903.1	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Thorium, total (3050)	M6020 ICP-MS
Uranium, total (3050)	M6020 ICP-MS

Radiochemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Radium 226 (3050)	M903.1

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Solids, Percent	CLPSOW390, PART F, D-98

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates, Inc.
07380026.0002

ACZ Project ID: L75211
Date Received: 4/9/2009
Received By:
Date Printed: 4/9/2009

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Is the trip blank for Cyanide present?			X
12) Is the trip blank for VOA present?			X
13) Are samples requiring no headspace, headspace free?			X
14) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

N/A

Contact (For any discrepancies, the client must be contacted)

N/A

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/hr)
NA8194	14.8	170

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates, Inc.
07380026.0002

ACZ Project ID: L75211
Date Received: 4/9/2009
Received By:

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L75211-01	BARBARA J3-1A									X		

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Sulfuric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: _____

L75211

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Bob Newcomer
Company: Golder Associates Inc
E-mail: bob_newcomer@golder.com
Address: 5200 Pasadena St. C
Albuquerque NM 87113
Telephone: 505-821-3043

Copy of Report to:

Name: Fiona Jorden
Company: Golder Associates
E-mail: fjorden@golder.com
Telephone: 505-821-3043

Invoice to:

Name: Toni Sanchez
Company: GOLDER ASSOCIATES
E-mail: toni_sanchez@golder.com
Address: 5200 Pasadena St. C
Albuquerque, NM 87113
Telephone: 505-821-3043

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

PROJECT INFORMATION

Quote #: AUML
Project/PO #: 07380076.0002
Shipping Co.: Fed Ex
Tracking #: 471158010000207
Reporting state for compliance testing:
Are any samples NRC licensable material?

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	AUML
Barbara 53-1A	4/2/09 1245	SO	1	X
	per container WPC 4-9-09			

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

please crush & pulverize sample

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
[signature]	4/6/09 1PM	[signature]	4-9-09 14:00

Page ___ Of ___

FRMQA021.12.03.06

White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

April 28, 2009

Report to:
Bob Newcomer
Golder Associates, Inc.
5200 Pasadena, N.E. Suite C
Albuquerque, NM 87113

Bill to:
Toni Sanchez
Golder Associates, Inc.
5200 Pasadena NE Suite C
Albuquerque, NM 87113

cc: Fiona Jordan

Project ID: 07380026.0002
ACZ Project ID: L75212

Bob Newcomer:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 09, 2009. This project has been assigned to ACZ's project number, L75212. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan, version 12.0. The enclosed results relate only to the samples received under L75212. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 28, 2009. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J3-3A

ACZ Sample ID: ***L75212-01***
Date Sampled: *04/02/09 00:00*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Thorium, total (3050)	M6020 ICP-MS	1.6	B	*	mg/Kg	0.5	3	04/21/09 3:15	erf
Uranium, total (3050)	M6020 ICP-MS	880		*	mg/Kg	1	5	04/21/09 18:12	erf

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	94.4		*	%	0.1	0.5	04/10/09 13:00	lwt

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/10/09 12:40	lwt
Crush and Pulverize	USDA No. 1, 1972							04/13/09 10:10	lwt
Digestion - Hot Plate	M3050B ICP-MS							04/14/09 10:40	lwt

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J2-1A

ACZ Sample ID: ***L75212-02***
Date Sampled: *04/02/09 00:00*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Thorium, total (3050)	M6020 ICP-MS	1.4	B	*	mg/Kg	0.5	3	04/21/09 3:25	erf
Uranium, total (3050)	M6020 ICP-MS	775		*	mg/Kg	0.5	3	04/21/09 18:21	erf

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	95.6		*	%	0.1	0.5	04/10/09 13:00	lwt

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/10/09 12:50	lwt
Crush and Pulverize	USDA No. 1, 1972							04/13/09 10:20	lwt
Digestion - Hot Plate	M3050B ICP-MS							04/14/09 11:45	lwt

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value.
	The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5)	EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6)	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995.

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Golder Associates, Inc.
Project ID: 07380026.0002

ACZ Project ID: ***L75212***

Solids, Percent CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262077													
WG262077PBS	PBS	04/10/09 13:00				U	%		99.9	100.1			
L75214-01DUP	DUP	04/10/09 13:00			95.1	93.96	%				1.2	20	

Thorium, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262507													
WG262507ICV	ICV	04/21/09 2:42	MS090326-1	.05		.0477	mg/L	95.4	90	110			
WG262507ICB	ICB	04/21/09 2:47				U	mg/L		-0.003	0.003			
WG262158PBS	PBS	04/21/09 3:06				U	mg/Kg		-1.5	1.5			
L75214-01MS	MS	04/21/09 3:34	MS090311-4	12.5	1.4	13.5	mg/Kg	96.8	75	125			
L75214-01MSD	MSD	04/21/09 3:48	MS090311-4	12.5	1.4	13.16	mg/Kg	94.1	75	125	2.55	20	

Uranium, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262537													
WG262537ICV	ICV	04/21/09 17:39	MS090326-1	.05		.04907	mg/L	98.1	90	110			
WG262537ICB	ICB	04/21/09 17:44				U	mg/L		-0.0003	0.0003			
WG262158PBS	PBS	04/21/09 18:03				U	mg/Kg		-0.15	0.15			
L75214-01MS	MS	04/21/09 18:31	MS090311-4	625	3000	3210	mg/Kg	33.6	75	125			M3
L75214-01MSD	MSD	04/21/09 18:45	MS090311-4	625	3000	3187.5	mg/Kg	30	75	125	0.7	20	M3

Inorganic Extended Qualifier Report

Golder Associates, Inc.

ACZ Project ID: ***L75212***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L75212-01	WG262537	Uranium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
L75212-02	WG262537	Uranium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J3-3A
Locator:

ACZ Sample ID: ***L75212-01***
Date Sampled: *04/02/09 0:00*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Gross Alpha & Beta (3050) Prep Method:
M9310

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Gross Alpha	04/24/09 13:06		470	23	2.2	pCi/g	*	bjl
Gross Beta	04/24/09 13:06		640	17	4.5	pCi/g	*	bjl

Radium 226 (3050) Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226 (3050)	04/22/09 16:54		230	2.8	0.45	pCi/g	*	mwm

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J2-1A
Locator:

ACZ Sample ID: ***L75212-02***
Date Sampled: *04/02/09 0:00*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Gross Alpha & Beta (3050) Prep Method:
M9310

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Gross Alpha	04/24/09 13:08		470	23	2.2	pCi/g	*	bjl
Gross Beta	04/24/09 13:08		610	16	4.5	pCi/g	*	bjl

Radium 226 (3050) Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226 (3050)	04/22/09 16:55		220	3.2	0.65	pCi/g	*	mwm

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Error(+/-)	Calculated sample specific uncertainty
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
LCL	Lower Control Limit, in % (except for LCSS, mg/Kg)
LLD	Calculated sample specific Lower Limit of Detection
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RER	Relative Error Ratio, calculation used for Dup. QC taking into account the error factor.
UCL	Upper Control Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

DUP	Sample Duplicate	MS/MSD	Matrix Spike/Matrix Spike Duplicate
LCSS	Laboratory Control Sample - Soil	PBS	Prep Blank - Soil
LCSW	Laboratory Control Sample - Water	PBW	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Matrix Spikes	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

H	Analysis exceeded method hold time.
R	Poor spike recovery accepted because the other spike in the set fell within the given limits.
T	High Replicate Error Ratio (RER) accepted because sample concentrations are less than 10x the MDL.
U	No nuclides detected above the Lower Limit of Detection (LLD)
V	High blank data accepted because sample concentration is 10 times higher than blank concentration
X	QC is out of control. See Case Narrative.
Z	Poor spike recovery is accepted because sample concentration is four times greater than spike concentration.

Method Prefix Reference

M	EPA methodology, including those under SDWA, CWA, and RCRA
SM	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995.
D	ASTM
RP	DOE
ESM	DOE/ESM

Comments

(1)	Solid matrices are reported on a dry weight basis.
(2)	Preparation method: "Method" indicates preparation defined in analytical method.
(3)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Radiochemistry QC Summary

Golder Associates, Inc.
Project ID: 07380026.0002

ACZ Project ID: ***L75212***

Alpha M9310 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262764																
WG262565PBS	PBS	04/24/09						.39	0.29	0.27			0.54			
WG262565LCSS	LCSS	04/24/09	RC081215-1	32.42				28	2.8	0.54	86.4	52	129			
L75211-01DUP	DUP-RER	04/24/09			1400	39	2.2	1200	37	2.3				3.72	2	RN
L75211-01DUP	DUP-RPD	04/24/09			1400	39	2.2	1200	37	2.3				15.4	20	RN
L75212-02MS	MS	04/24/09	RC081215-1	101.32	470	23	2.2	430	24	2.6	-39.5	52	129			M3

Beta M9310 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262764																
WG262565PBS	PBS	04/24/09						1.2	0.6	0.77			1.54			
WG262565LCSS	LCSS	04/24/09	PCN30789	40				39	2.6	1.6	97.5	65	104			
L75211-01DUP	DUP-RER	04/24/09			1700	27	4.5	1300	23	4.4				11.28	2	RC
L75214-01MS	MS	04/24/09	PCN30789	111.11	2300	31	4.5	2600	33	4.5	270	65	104			M3

Radium 226 (3050) M903.1 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262679																
WG262382PBS	PBS	04/22/09						-.01	0.19	0.48			0.96			
WG262382LCSS	LCSS	04/22/09	RC090209-1	47.83				53	1.5	0.6	110.8	44	128			
L75211-01DUP	DUP-RER	04/22/09			580	4	0.38	670	4.5	0.41				14.95	2	RN
L75211-01DUP	DUP-RPD	04/22/09			580	4	0.38	670	4.5	0.41				14.4	20	RN
L75214-01MS	MS	04/22/09	RC090209-1	47.83	980	5.9	0.48	1300	8.2	0.73	669	44	128			M3

Golder Associates, Inc.

ACZ Project ID: ***L75212***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L75212-01	WG262764	Gross Alpha	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.
		Gross Beta	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RC	For a solid matrix, the matrix duplicate precision assessment (RPD or RER) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG262679	Radium 226 (3050)	M903.1	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M903.1	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.
L75212-02	WG262764	Gross Alpha	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.
		Gross Beta	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RC	For a solid matrix, the matrix duplicate precision assessment (RPD or RER) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG262679	Radium 226 (3050)	M903.1	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M903.1	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.

Golder Associates, Inc. ACZ Project ID: ***L75212***

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
Thorium, total (3050)	M6020 ICP-MS
Uranium, total (3050)	M6020 ICP-MS

Radiochemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
Radium 226 (3050)	M903.1

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
Solids, Percent	CLPSOW390, PART F, D-98

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates, Inc.
07380026.0002

ACZ Project ID: L75212
Date Received: 4/9/2009
Received By:
Date Printed: 4/9/2009

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Is the trip blank for Cyanide present?			X
12) Is the trip blank for VOA present?			X
13) Are samples requiring no headspace, headspace free?			X
14) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

N/A

Contact (For any discrepancies, the client must be contacted)

N/A

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/hr)
NA8195	16.3	100

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates, Inc.
07380026.0002

ACZ Project ID: L75212
Date Received: 4/9/2009
Received By:

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L75212-01	BARBARA J3-3A									X		
L75212-02	BARBARA J2-1A									X		

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Sulfuric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: _____

L75012

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Bob Newcomer
Company: Golder Associates Inc
E-mail: bob_newcomer@golder.com
Address: 5200 Pasadena Ste C Albuquerque NM 87113
Telephone: 505-821-3043

Copy of Report to:

Name: Fiona Jorden
Company: Golder Associates
E-mail: fjorden@golder.com
Telephone: 505-821-3043

Invoice to:

Name: Toni Sanchez
Company: GOLDER ASSOCIATES
E-mail: toni_sanchez@golder.com
Address: 5200 Pasadena Ste. C Albuquerque, NM 87113
Telephone: 505-821-3043

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

PROJECT INFORMATION

Quote #: AUML
Project/PO #: 07380026.0002
Shipping Co.: Fed Ex
Tracking #: 471158010000191
Reporting state for compliance testing:
Are any samples NRC licensable material?

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	AUML
Barbara J3-3A	4/2/09	SO	1	X
Barbara J2-1A	4/2/09	SO	1	X

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

please crush & pulverize entire sample

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
[signature]	4/6/09 1pm	[signature]	4-9-09 14:00

Page Of

FRMQA021.12.03.06

White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

April 28, 2009

Report to:
Bob Newcomer
Golder Associates, Inc.
5200 Pasadena, N.E. Suite C
Albuquerque, NM 87113

Bill to:
Toni Sanchez
Golder Associates, Inc.
5200 Pasadena NE Suite C
Albuquerque, NM 87113

cc: Fiona Jordan

Project ID: 07380026.0002
ACZ Project ID: L75214

Bob Newcomer:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 09, 2009. This project has been assigned to ACZ's project number, L75214. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan, version 12.0. The enclosed results relate only to the samples received under L75214. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 28, 2009. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J3-2AS

ACZ Sample ID: ***L75214-01***
Date Sampled: *04/02/09 00:00*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Thorium, total (3050)	M6020 ICP-MS	1.4	B	*	mg/Kg	0.5	3	04/21/09 3:29	erf
Uranium, total (3050)	M6020 ICP-MS	3000		*	mg/Kg	3	10	04/21/09 18:26	erf

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	95.1		*	%	0.1	0.5	04/10/09 13:00	lwt

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/10/09 13:00	lwt
Crush and Pulverize	USDA No. 1, 1972							04/13/09 10:30	lwt
Digestion - Hot Plate	M3050B ICP-MS							04/14/09 12:50	lwt

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value.
	The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5)	EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6)	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995.

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Golder Associates, Inc.
Project ID: 07380026.0002

ACZ Project ID: ***L75214***

Solids, Percent CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262077													
WG262077PBS	PBS	04/10/09 13:00				U	%		99.9	100.1			
L75214-01DUP	DUP	04/10/09 13:00			95.1	93.96	%				1.2	20	

Thorium, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262507													
WG262507ICV	ICV	04/21/09 2:42	MS090326-1	.05		.0477	mg/L	95.4	90	110			
WG262507ICB	ICB	04/21/09 2:47				U	mg/L		-0.003	0.003			
WG262158PBS	PBS	04/21/09 3:06				U	mg/Kg		-1.5	1.5			
L75214-01MS	MS	04/21/09 3:34	MS090311-4	12.5	1.4	13.5	mg/Kg	96.8	75	125			
L75214-01MSD	MSD	04/21/09 3:48	MS090311-4	12.5	1.4	13.16	mg/Kg	94.1	75	125	2.55	20	

Uranium, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG262537													
WG262537ICV	ICV	04/21/09 17:39	MS090326-1	.05		.04907	mg/L	98.1	90	110			
WG262537ICB	ICB	04/21/09 17:44				U	mg/L		-0.0003	0.0003			
WG262158PBS	PBS	04/21/09 18:03				U	mg/Kg		-0.15	0.15			
L75214-01MS	MS	04/21/09 18:31	MS090311-4	625	3000	3210	mg/Kg	33.6	75	125			M3
L75214-01MSD	MSD	04/21/09 18:45	MS090311-4	625	3000	3187.5	mg/Kg	30	75	125	0.7	20	M3

Golder Associates, Inc.

ACZ Project ID: ***L75214***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L75214-01	WG262537	Uranium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

Golder Associates, Inc.
Project ID: 07380026.0002
Sample ID: BARBARA J3-2AS
Locator:

ACZ Sample ID: ***L75214-01***
Date Sampled: *04/02/09 0:00*
Date Received: *04/09/09*
Sample Matrix: *Soil*

Gross Alpha & Beta (3050) Prep Method:
M9310

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Gross Alpha	04/24/09 13:09		1900	46	2.3	pCi/g	*	bjl
Gross Beta	04/24/09 13:09		2300	31	4.5	pCi/g	*	bjl

Radium 226 (3050) Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226 (3050)	04/22/09 16:57		980	5.9	0.48	pCi/g	*	mwm

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Error(+/-)	Calculated sample specific uncertainty
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
LCL	Lower Control Limit, in % (except for LCSS, mg/Kg)
LLD	Calculated sample specific Lower Limit of Detection
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RER	Relative Error Ratio, calculation used for Dup. QC taking into account the error factor.
UCL	Upper Control Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

DUP	Sample Duplicate	MS/MSD	Matrix Spike/Matrix Spike Duplicate
LCSS	Laboratory Control Sample - Soil	PBS	Prep Blank - Soil
LCSW	Laboratory Control Sample - Water	PBW	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Matrix Spikes	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

H	Analysis exceeded method hold time.
R	Poor spike recovery accepted because the other spike in the set fell within the given limits.
T	High Replicate Error Ratio (RER) accepted because sample concentrations are less than 10x the MDL.
U	No nuclides detected above the Lower Limit of Detection (LLD)
V	High blank data accepted because sample concentration is 10 times higher than blank concentration
X	QC is out of control. See Case Narrative.
Z	Poor spike recovery is accepted because sample concentration is four times greater than spike concentration.

Method Prefix Reference

M	EPA methodology, including those under SDWA, CWA, and RCRA
SM	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995.
D	ASTM
RP	DOE
ESM	DOE/ESM

Comments

(1)	Solid matrices are reported on a dry weight basis.
(2)	Preparation method: "Method" indicates preparation defined in analytical method.
(3)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Radiochemistry QC Summary

Golder Associates, Inc.
Project ID: 07380026.0002

ACZ Project ID: ***L75214***

Alpha M9310 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262764																
WG262565PBS	PBS	04/24/09						.39	0.29	0.27			0.54			
WG262565LCSS	LCSS	04/24/09	RC081215-1	32.42				28	2.8	0.54	86.4	52	129			
L75211-01DUP	DUP-RER	04/24/09			1400	39	2.2	1200	37	2.3				3.72	2	RN
L75211-01DUP	DUP-RPD	04/24/09			1400	39	2.2	1200	37	2.3				15.4	20	RN
L75212-02MS	MS	04/24/09	RC081215-1	101.32	470	23	2.2	430	24	2.6	-39.5	52	129			M3

Beta M9310 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262764																
WG262565PBS	PBS	04/24/09						1.2	0.6	0.77			1.54			
WG262565LCSS	LCSS	04/24/09	PCN30789	40				39	2.6	1.6	97.5	65	104			
L75211-01DUP	DUP-RER	04/24/09			1700	27	4.5	1300	23	4.4				11.28	2	RC
L75214-01MS	MS	04/24/09	PCN30789	111.11	2300	31	4.5	2600	33	4.5	270	65	104			M3

Radium 226 (3050) M903.1 pCi/g

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG262679																
WG262382PBS	PBS	04/22/09						-.01	0.19	0.48			0.96			
WG262382LCSS	LCSS	04/22/09	RC090209-1	47.83				53	1.5	0.6	110.8	44	128			
L75211-01DUP	DUP-RER	04/22/09			580	4	0.38	670	4.5	0.41				14.95	2	RN
L75211-01DUP	DUP-RPD	04/22/09			580	4	0.38	670	4.5	0.41				14.4	20	RN
L75214-01MS	MS	04/22/09	RC090209-1	47.83	980	5.9	0.48	1300	8.2	0.73	669	44	128			M3

Golder Associates, Inc.

ACZ Project ID: ***L75214***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L75214-01	WG262764	Gross Alpha	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.
		Gross Beta	M9310	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M9310	RC	For a solid matrix, the matrix duplicate precision assessment (RPD or RER) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG262679	Radium 226 (3050)	M903.1	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M903.1	RN	Sample concentration is greater than 5x LLD; RPD was used for data validation. Replicate Error Ratio (RER) is greater than 2. Precision judged to be in control.

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Thorium, total (3050)	M6020 ICP-MS
Uranium, total (3050)	M6020 ICP-MS

Radiochemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Radium 226 (3050)	M903.1

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Solids, Percent	CLPSOW390, PART F, D-98

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates, Inc.
07380026.0002

ACZ Project ID: L75214
Date Received: 4/9/2009
Received By:
Date Printed: 4/9/2009

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Is the trip blank for Cyanide present?			X
12) Is the trip blank for VOA present?			X
13) Are samples requiring no headspace, headspace free?			X
14) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

N/A

Contact (For any discrepancies, the client must be contacted)

N/A

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/hr)
NA8193	15.7	200

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates, Inc.
07380026.0002

ACZ Project ID: L75214
Date Received: 4/9/2009
Received By:

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L75214-01	BARBARA J3-2AS									X		

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Sulfuric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: _____

L75214

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Bob Newcomer
Company: Golder Associates Inc
E-mail: bob_newcomer@golder.com
Address: 5200 Pasadena Ste C Albuquerque NM 87113
Telephone: 505-821-3043

Copy of Report to:

Name: Fiona Jordan
Company: Golder Associates
E-mail: fjordan@golder.com
Telephone: 505-821-3043

Invoice to:

Name: Toni Sanchez
Company: GOLDER ASSOCIATES
E-mail: toni_sanchez@golder.com
Address: 5200 Pasadena Ste. C Albuquerque, NM 87113
Telephone: 505-821-3043

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

PROJECT INFORMATION

Quote #: AUML
Project/PO #: 07380026.0002
Shipping Co.: Fed Ex
Tracking #: 477158010000184
Reporting state for compliance testing:
Are any samples NRC licensable material?

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	AUML
Barbara JB-2AS	4/2/09	SO	1	X

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please crush & pulverize entire sample.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
	4/6/09 1pm		

Page Of

FRMQA021.12.03.06

White - Return with sample. Yellow - Retain for your records.

ATTACHMENT C

Gamma Ray Activity Measurements Regression Analysis Summaries

REGRESSION ANALYSIS -LOW-END Ra-226 FIELD DATA

Regression Statistics	
Multiple R	0.76
R Square	0.58
Adj. R Square	0.47
Standard Error	10.35
Observations	10

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1316.33	1316.33	12.29	0.01
Residual	9	964.20	107.13		
Total	10	2280.53			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.004	0.001	3.505	0.007	0.001	0.007

95 % C. I.		
counts	upper	lower
0	0.00	0.00
300	2.00	0.43
750	5.00	1.08
1500	9.99	2.15
3000	19.98	4.31
6000	39.97	8.61
8000		11.49

REGRESSION ANALYSIS -LOW-END Ra-226 LAB

Regression Statistics	
Multiple R	0.93
R Square	0.86
Adjusted R Squa	0.75
Standard Error	5.97
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	1959.81	1959.8077	54.9954	0.0001
Residual	9	320.72	35.6358		
Total	10	2280.53			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.018	0.002	7.416	0.000	0.012	0.023

95 % C. I.		
counts	upper	lower
0	0.00	0.00
500	11.64	6.20
700	16.29	8.67
900	20.94	11.15
1200	27.92	14.87
1500	34.91	18.59
2500		30.98

REGRESSION ANALYSIS -LOW-END Ra-226 FIELD (y-intercept)

Regression Statistics	
Multiple R	0.49
R Square	0.24
Adj. R Square	0.15
Standard Error	10.51
Observations	10.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	279.63	279.63	2.53	0.15
Residual	8.00	883.65	110.46		
Total	9.00	1163.28			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	4.37	5.12	0.85	0.42	-7.43	16.18
X Variable 1	0.00	0.00	1.59	0.15	0.00	0.01

95 % C. I.		
counts	upper	lower
0	16.18	-7.43
400	19.00	-7.95
1000	23.22	-8.73
2000	30.26	-10.02
3000	37.30	-11.31
4000	44.34	-12.60
5000	51.38	-13.89
6000	58.43	-15.18

REGRESSION ANALYSIS -LOW-END Ra-226 (y-intercept)

Regression Statistics	
Multiple R	0.97
R Square	0.95
Adj. R Square	0.94
Standard Error	2.69
Observations	10.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	1105.53	1105.53	153.13	0.00
Residual	8.00	57.76	7.22		
Total	9.00	1163.28			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-12.26	2.03	-6.04	0.00	-16.94	-7.57
X Variable 1	0.03	0.00	12.37	0.00	0.03	0.04

95 % C. I.		
counts	upper	lower
0	-7.57	-16.94
500	11.41	-3.92
700	19.01	1.29
900	26.61	6.50
1200	38.00	14.31
1500	49.39	22.13
2500		48.17

REGRESSION ANALYSIS --LOW-END U-238 FIELD DATA

Regression Statistics	
Multiple R	0.95
R Square	0.90
Adj. R Square	0.79
Standard Error	1.20
Observations	10.00

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	115.85	115.85	80.4593	0.0000
Residual	9	12.96	1.44		
Total	10	128.81			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.0012	0.0001	8.9699	0.0000	0.0009	0.0015

95 % C. I.		
counts	upper	lower
0	0.00	0.00
400	0.60	0.36
1000	1.50	0.90
2000	3.01	1.80
3000	4.51	2.69
4000	6.02	3.59
5000	7.52	4.49
6000	9.02	5.39

REGRESSION ANALYSIS --LOW-END U-238 LAB DATA

Regression Statistics	
Multiple R	0.87
R Square	0.75
Adj. R Square	0.64
Standard Error	1.88
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	97.15	97.15	27.611	0.001
Residual	9	31.67	3.52		
Total	10	128.81			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.0040	0.0008	5.2547	0.0005	0.0023	0.0057

95 % C. I.		
counts	upper	lower
0	0.00	0.00
500	2.84	1.13
700	3.98	1.58
900	5.11	2.03
1200	6.81	2.71
1500	8.52	3.39
2500		5.65

REGRESSION ANALYSIS -LOW-END U-238 FIELD DATA (y-intercept)

Regression Statistics	
Multiple R	0.87
R Square	0.76
Adj. R Square	0.73
Standard Error	1.21
Observations	10.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	38.07	38.07	25.79	0.00
Residual	8.00	11.81	1.48		
Total	9.00	49.88			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.52	0.59	0.88	0.40	-0.84	1.89
X Variable 1	0.00	0.00	5.08	0.00	0.00	0.00

95 % C. I.		
counts	upper	lower
0	1.89	-0.84
400	2.50	-0.61
1000	3.43	-0.26
2000	4.97	0.32
3000	6.51	0.90
4000	8.06	1.47
5000	9.60	2.05
6000	11.14	2.63

REGRESSION ANALYSIS -LOW-END U-238_LAB DATA (y-intercept)

Regression Statistics	
Multiple R	0.60
R Square	0.37
Adj. R Square	0.29
Standard Error	1.99
Observations	10.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	18.24	18.24	4.61	0.06
Residual	8.00	31.64	3.95		
Total	9.00	49.88			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0.12	1.50	-0.08	0.94	-3.59	3.34
X Variable 1	0.00	0.00	2.15	0.06	0.00	0.01

95 % C. I.		
counts	upper	lower
0	3.34	-3.59
500	7.61	-3.74
700	9.31	-3.80
900	11.02	-3.86
1200	13.58	-3.95
1500	16.13	-4.04
2500	24.66	-4.35

REGRESSION ANALYSIS -Ra-226 FIELD DATA

Regression Statistics	
Multiple R	0.98
R Square	0.97
Adj. R Square	0.90
Standard Error	55.15
Observations	16.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
	1.00	1368075.12	1368075.12	449.72	0.00
Residual	15.00	45630.41	3042.03		
Total	16.00	1413705.53			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.00	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable	0.015	0.00	21.21	0.00	0.013	0.016

95 % C. I.		
counts	upper	lower
400	6.49	5.31
1000	16.24	13.27
5000	81.19	66.36
10000	162.37	132.72
20000	324.75	265.43
40000	649.50	530.86
60000	974.24	796.29
80000	1298.99	1061.72

REGRESSION ANALYSIS -Ra-226 LAB DATA

Regression Statistics	
Multiple R	0.90
R Square	0.82
Adj. R Square	0.75
Standard Error	131.46
Observations	16.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1154490.5	1154490.5	66.8	0.00
Residual	15	259215.07	17281.00		
Total	16	1413705.5			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable	0.060	0.01	8.17	0.00	0.04	0.08

95 % C. I.		
counts	upper	lower
400	30.47	17.87
800	60.94	35.73
1600	121.89	71.47
3200	243.78	142.93
6400	487.55	285.86
12000	914.16	536.00
20000	1523.60	893.33

REGRESSION ANALYSIS -Ra-226 LAB DATA (including intercept)

Regression Statistics	
Multiple R	0.88
R Square	0.77
Adj. R Square	0.75
Standard Error	133.79
Observations	16.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	838565.91	838565.91	46.85	0.00
Residual	14	250610.02	17900.72		
Total	15	1089175.9			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-28.97	41.78	-0.69	0.50	-118.59	60.65
X Variable	0.06	0.01	6.84	0.00	0.04	0.08

95 % C. I.		
counts	upper	lower
0	60.65	-118.59
400	94.44	-100.92
750	124.01	-85.46
1500	187.38	-52.33
3000	314.11	13.92
6000	567.57	146.44
12000	1074.49	411.46
22000		853.16

REGRESSION ANALYSIS -Ra-226 FIELD DATA (including intercept)

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adj. R Square	0.96
Standard Error	55.22
Observations	16.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	1046485.04	1046485.04	343.18	0.00
Residual	14.00	42690.89	3049.35		
Total	15.00	1089175.92			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-15.94	16.24	-0.98	0.34	-50.77	18.88
X Variable	0.015	0.00	18.53	0.00	0.013	0.017

95 % C. I.		
counts	upper	lower
400	25.66	-45.40
1000	35.82	-37.35
5000	103.56	16.33
10000	188.24	83.44
20000	357.59	217.65
40000	696.29	486.06
60000	1035.00	754.47
80000	1373.70	1022.89

REGRESSION ANALYSIS -U-238 FIELD DATA

Regression Statistics	
Multiple R	0.97
R Square	0.93
Adj. R Square	0.87
Standard Error	86.18
Observations	16.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1584642	1584642	213.343	0.000
Residual	15	111415	7428		
Total	16	1696057			

	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.016	0.001	14.606	0.000	0.014	0.018

95 % C. I.		
counts	upper	lower
400	7.28	5.42
1000	18.20	13.56
5000	90.98	67.81
10000	181.97	135.62
20000	363.93	271.24
40000	727.87	542.49
60000	1091.80	813.73
80000	1455.73	1084.97

REGRESSION ANALYSIS -U-238 LABORTORY DATA

Regression Statistics	
Multiple R	0.93
R Square	0.86
Adj. R Square	0.80
Standard Error	124.93
Observations	16

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1461953.5	1461953.5	93.673461	1.398E-07
Residual	15	234103.69	15606.913		
Total	16	1696057.2			

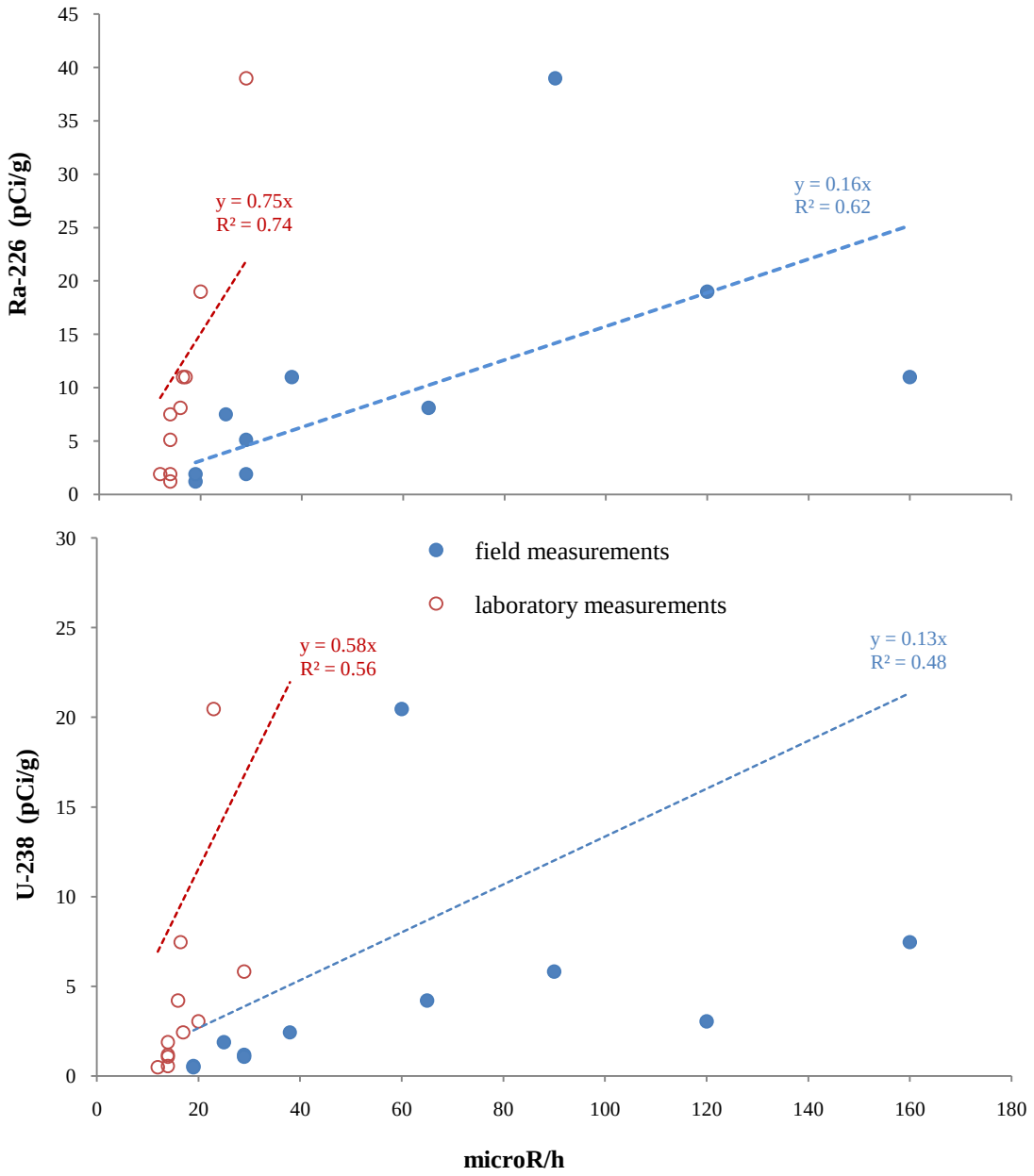
	Coefficients	*Std. Err.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.068	0.007	9.679	0.000	0.053	0.083

95 % C. I.		
counts	upper	lower
0	0.00	0.00
400	33.19	21.21
800	66.38	42.42
1600	132.75	84.83
3200	265.50	169.67
6400	531.00	339.33
12000	995.63	636.25
20000		1060.41

ATTACHMENT D

MicroR Meter Regression Analysis Summaries

Attachment D. Regression analysis for soil radionuclide concentrations and low-end exposure rates taken in the field (blue) and Golder laboratory (red).



REGRESSION ANALYSIS SUMMARY OUTPUT-Laboratory Ra-226

Regression Statistics	
Multiple R	0.86
R Square	0.74
Adj. R Squa	0.63
Standard Er	8.05
Observation	10.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1697.83	1697.83	26.22	0.00
Residual	9	582.70	64.74		
Total	10	2280.53			

	Coefficients	*Std Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.754	0.147	5.121	0.001	0.421	1.087

SUMMARY OUTPUT-Field Ra-226

Regression Statistics	
Multiple R	0.79
R Square	0.62
Adj. R Squa	0.51
Standard Er	9.84
Observation	10.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1408.4	1408.4	14.5	0.01
Residual	9	872.1	96.9		
Total	10	2280.5			

	Coefficients	*Std Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.157	0.041	3.812	0.004	0.064	0.251

REGRESSION ANALYSIS SUMMARY OUTPUT-Laboratory U-238

Regression Statistics	
Multiple R	0.75
R Square	0.56
Adj. R Square	0.47
Standard Error	10.86
Observations	12.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1657.3	1657.3013	14.059904	0.004
Residual	11	1296.6	117.87429		
Total	12	2953.9			

	Coefficients	*Std Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.58	0.15	3.75	0.00	0.24	0.92

SUMMARY OUTPUT-Field U-238

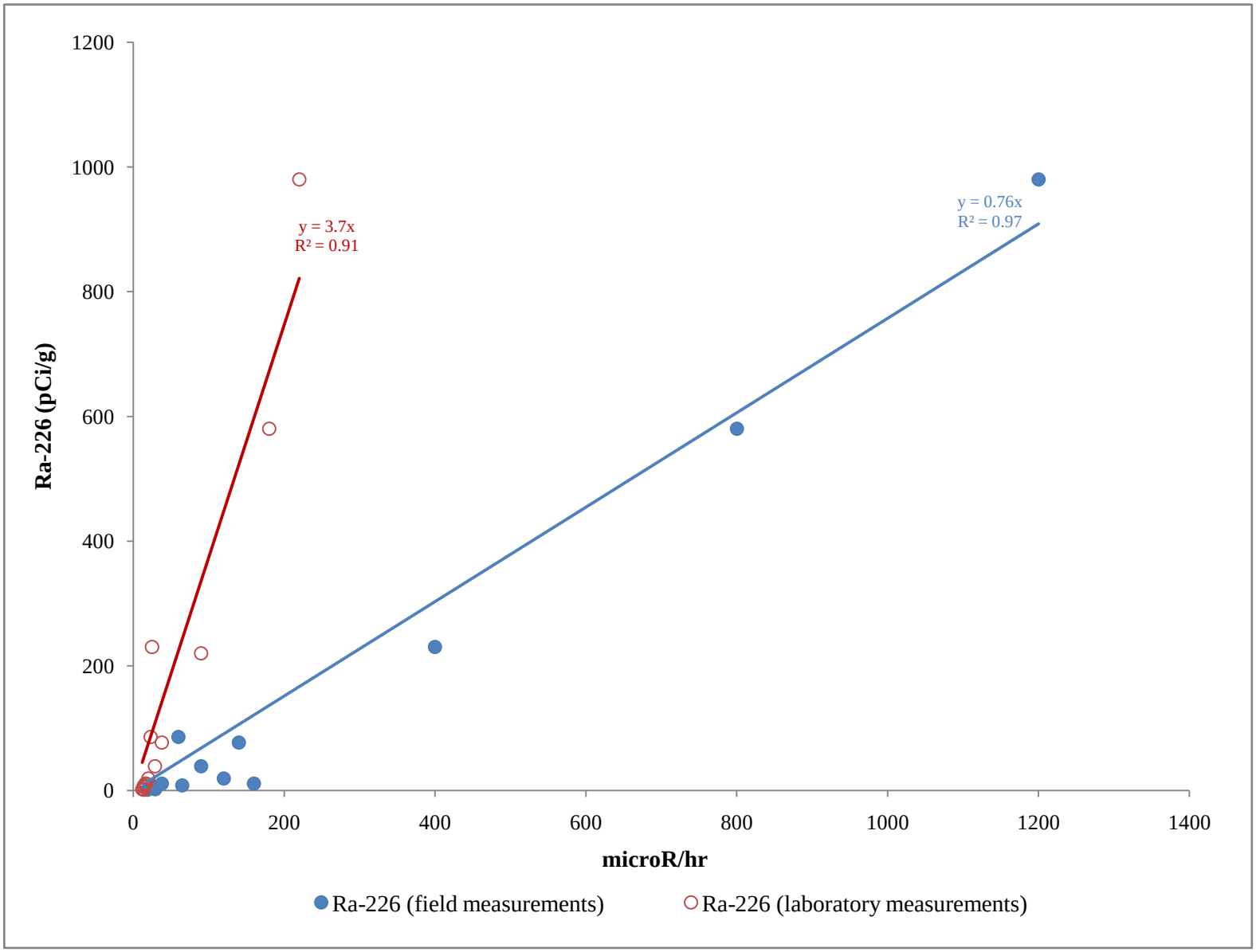
Regression Statistics	
Multiple R	0.69
R Square	0.48
Adj. R Square	0.39
Standard Error	11.79
Observations	12.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1424.2	1424.2	10.24	0.01
Residual	11	1529.7	139.1		
Total	12	2953.9			

	Coefficients	*Std Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.13	0.04	3.20	0.01	0.04	0.23

Attachment D. Linear relationships between exposure rates and soil Ra-226 concentrations taken in the field (blue) and Golder laboratory (red).



Attachment D. Linear relationships between exposure rates and soil U-238 concentrations taken in the field (blue) and Golder laboratory (red).